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User's Manual for Levelized Power Generation Cost Using an IBM PC

L. C. Fuller

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USER'S MANUAL FOR LEVELIZED POWER GENERATION COST USING AN IBM PC

L. C. Fuller

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USER'S MANUAL FOR LEVELIZED POWER GENERATION COST USING AN IBM PC

L. C. Fuller

ABSTRACT

Programs for the estimation of levelized electric power generation costs using the BASIC interpreter on an IBM PC are described. Procedures for light-water reactor plants and coal-fired plants include capital investment cost, operation and maintenance cost, fuel cycle cost, nuclear decommissioning cost, and levelized total generation cost.

Keywords: microcomputer, BASIC, power generation cost, coal-fired power plants, light-water reactor plants, economic evaluations, power plant economics, operation and maintenance cost, capital investment cost, fuel cycle cost, levelized cost.

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1. INTRODUCTION

This report describes a set of microcomputer programs for estimating power generation costs for large steam-electric power plants. These programs permit rapid evaluations using various sets of economic and technical ground rules. The levelized power generation costs that are calculated with these programs may be used to compare the relative economics of nuclear and coal-fired plants based on lifetime costs. It is anticipated that these programs will be useful for determining the sensitivity of power generation cost to such parameters as interest rate, escalation rate, inflation rate, lead times, capacity factor, fuel prices, and year of commercial operation.

Two major types of electric generating plants considered are pressurized-water reactor (PWR) and coal-fired. Costs for one through four units per plant may be obtained. This report describes procedures for

estimating levelized power generation cost. The capital investment cost procedures are modeled after the CONCEPT-5 code;[1] the operation and maintenance (O&M) procedures are modeled after the OMCOST code.[2] The nuclear fuel cycle cost procedures are based on those in the REFCO[3] computer code, and the levelization procedures are those described in the Nuclear Energy Cost Data Base.[4]

Each of these codes was developed independently and as such may differ in level of detail in a given area. The OMCOST code program is based on the OMCOST[2] code and includes the option of scrubbing for flue gas desulfurization (FGD), and further it allows the selection of a wet limestone FGD system or a dry FGD system. The CONCEPT-5 code does not contain the option of dry scrubbers, but the cost difference could be forced through the use of NAMELIST data. Inconsistencies of this type will become more apparent when the input data for each routine is described.

The work described in this report and in Ref. 5 represents a first step in converting the mainframe computer programs to use on microcomputers. The objective was to provide conversions for in-house use by staff already familiar with the original mainframe programs, which were written by different authors at different times using different terminology. In this first step, no attempt has been made to convert to a common terminology, and there is no linking of the microcomputer programs. Thus there are inconsistencies in terminology among programs, and output data from one program must be input manually to other programs.

The microcomputer programs were originally written in Pascal[5] for the Apple II plus computer and then translated to advanced BASIC for the IBM PC. Programs are stored on floppy disks. Input is prompted on the IBM PC Monitor and output is printed on a printer. Example problem output is included in Appendixes A and B, and listings of the programs are included in Appendix C.

2. POWER GENERATION COST METHODOLOGY

Power generation cost consists of several components: capital investment cost, operation and maintenance cost, and fuel or fuel cycle cost. Nuclear plants incur an additional cost to pay for decommissioning.

The comparative analysis of power generation cost may be done using either a constant or current dollar analysis. This package calculates levelized power generation cost using the methodology recommended in the Nuclear Energy Cost Data Base of Ref. 4. This methodology explicitly considers inflation and differential escalation rates. Market rates of return are used directly; the inflation component is not removed. The rate of price change is divided into a general inflation component as measured by the Gross National Product Implicit Price Deflator and a differential escalation component (real cost escalation resulting from new regulations, changes in efficiency, etc.). The price or cost in any year is related to that in the reference year by the following relationship:

$$C_m = C_o\ (1 + i)^m\ (1 + g)^m = C_o\ \ (1 + r)^m$$

where

C_m = cost, m years removed from reference year,

C_o = cost in reference year,

i = general inflation rate,

g = differential escalation rate, and

r = overall rate of price change.

The methodology seeks a single levelized price which will produce the same present worth of revenues as the stream of actual yearly prices. Levelized power generation cost can then be expressed in either constant dollars or in current dollars. Current (or nominal) dollar levelized price remains constant over facility life in "then-current" or "as-spent" dollars even though buying power of the dollar varies with time. In contrast, constant dollar levelized price is an equivalent price referenced to a given year's purchasing power. Constant dollar

and current dollar levelized prices represent two methods of expressing the same value. The reader is referred to Ref. 4 for further discussion of the levelized cost method.

3. PACKAGE ORGANIZATION

All models are contained on one diskette volume with no label. The models are:

COALCO.BAS
PWROM.BAS
COACAP.BAS
WETOM.BAS
DRYOM.BAS
CAPCOS.BAS
FCRATE.BAS
PWRCAP.BAS
LEVEL.BAS
NFUEL.BAS

Many later references to the above models will refer to the models without the extension ".BAS". It should be understood that all programs are stored on diskette with the extension .BAS.

There are three capital investment cost models. PWRCAP and COACAP are specifically intended to model PWR and coal-fired plants, respectively. CAPCOS allows the user to input overnight direct and indirect costs for different plant types for an input base size and base year. The models will calculate capital investment cost for one to four units at various plant locations, interest rates, escalation rates, sizes, and dates. The files are PWRCAP, COACAP, and CAPCOS for the PWR, coal-fired, and overnight-cost-input versions, respectively.

There are three operation and maintenance cost models: PWROM, WETOM, and DRYOM for the following plant types: PWR, coal-fired with wet FGD system, and coal-fired with dry FGD.

A nuclear fuel cycle cost code, NFUEL, and a coal cost code, COALCO, are included.

Levelized cost for PWR, coal-fired, or other plants may be obtained through the use of LEVEL. LEVEL requires a fixed charge rate as part of its input. Fixed charge rates may be obtained through the use of FCRATE.

Figure 3.1 shows the relationship between the ten BASIC programs. Any of the programs may be run separately. All that is required is the appropriate set of input data. Most of the input data required by LEVEL

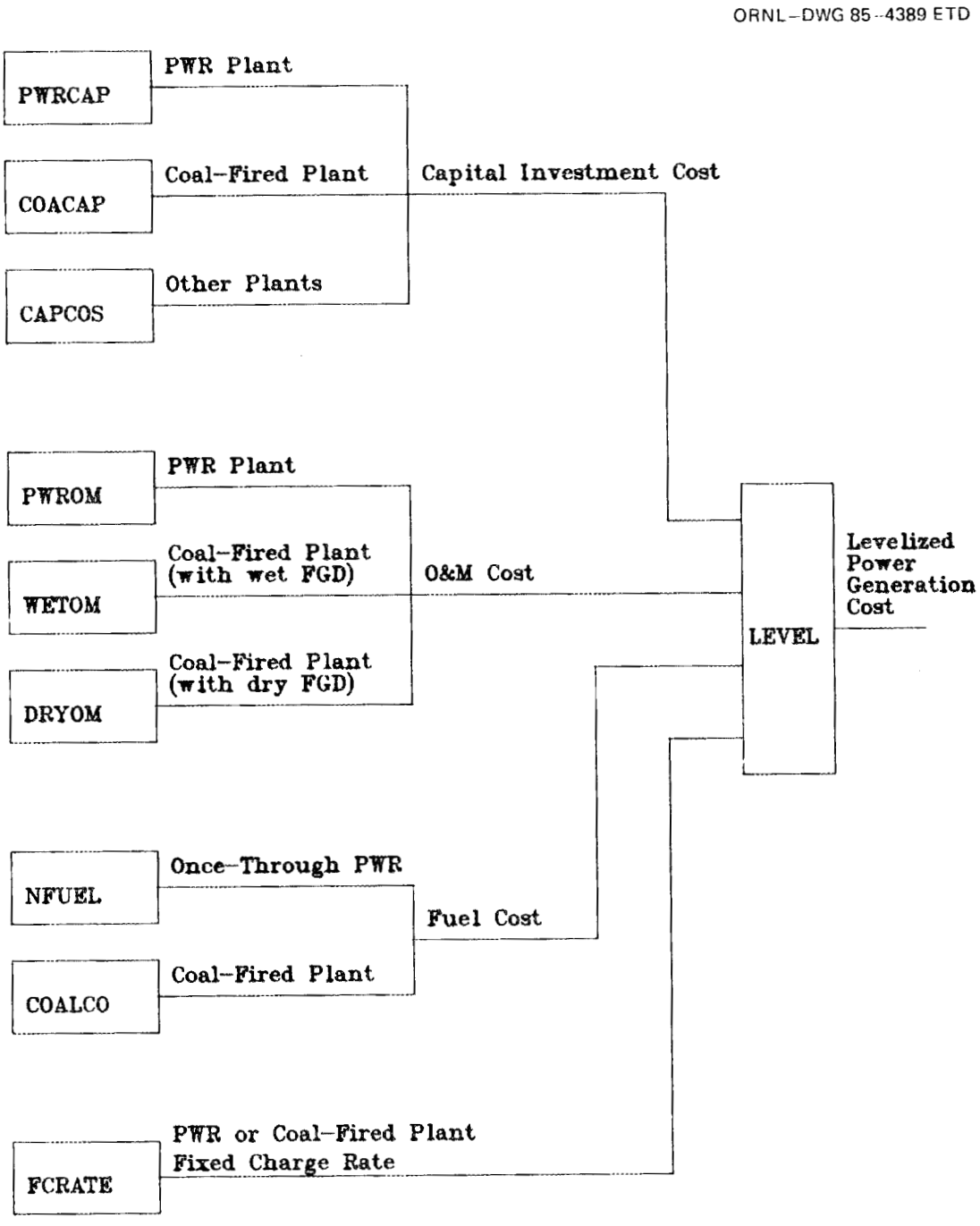

Fig. 3.1. Relationship among microcomputer programs to calculate levelized power generation cost.

can by obtained by running other programs. LEVEL may also be run without the use of any other program from the package. Each routine requires menu-driven input and produces line-printer output. The user then selects the appropriate output from the capital investment cost code, O&M cost code, fuel cost code, and fixed charge rate code to provide input for LEVEL.

4. DISCUSSION OF COST MODELS

4.1 Capital Investment Cost

The capital investment cost models are simplified versions of CONCEPT-5 methodology (Ref. 3). Output from CONCEPT-5 runs was used to establish a base cost model for the PWR plant and for the coal-fired plant. The base year (1983) model by two-digit account and cost category (equipment, labor, and material) is the starting point for all calculations. Indirect costs are also taken from CONCEPT output. For the PWR and coal-fired models the cost-size scaling factors are taken from the CONCEPT models for all direct and indirect costs. This does not apply to CAPCOS since directs and indirects before escalation are supplied as input data.

Direct and indirect costs are escalated from the base year for the cost model to the year of steam supply purchase using an escalation rate which may be changed by the user. There is no extrapolation of past escalation data as in CONCEPT. A contingency allowance, which may be changed by the user, is added to the total direct and indirect costs before construction period interest and escalation are calculated.

The calculation of interest and escalation during construction utilizes a smooth trigonometric S-curve to simulate the construction cash flow curve. The S-curve is skewed to the right or to the left as the year of construction permit is changed for fixed steam supply system purchase date and plant commercial operation date. Virtually all difference between the results of a CONCEPT run and the results of a PWRCAP or COACAP run are due to differences in the construction S-curve used, since the CONCEPT code utilizes tabular data for each two-digit-level account to simulate construction cash flows.

Site dependent effects are included through the use of plant location (city) multipliers. CONCEPT runs were made using base case conditions except for the use of ten cities taken from Ref. 6. These locations are representative of the ten Energy Information Administration regions. The correction for a new location is done by the use of multipliers, which relate bottom line capital investment cost (direct and

indirect) at a new location to bottom line cost at the reference Middletown location.

After making adjustment for plant location, capital investment costs for one through four units per plant are printed out. Again, multiple unit costs were obtained from CONCEPT runs and converted to multipliers for use in these models. First a stand-alone CONCEPT case was run. Then a two-unit case was run. The multipliers for three- and four-unit cases were obtained by considering the third and fourth units to have costs equal to the second unit of a two-unit plant.

While it is expected that the user will normally input only plant size, construction dates, interest rate, escalation rate, contingency percentage, and location, it is possible to edit a copy of a capital investment cost model and simulate changes to items such as labor intensity (manhours per kW), overtime, etc. This would require either calculations external to the program or perhaps CONCEPT runs, which could provide data as a basis for editing of a BASIC program.

4.2 Operation and Maintenance Cost

The operation and maintenance cost models (PWROM, WETOM, and DRYOM) follow the procedures outlined in Ref. 2 with few exceptions. No changes have been made to the OMCOST equations, and the OMCOST variable names have been retained. The user can consult Ref. 2 for a detailed description of the algorithms. The user should be able to reproduce the sample problems from OMCOST report with the exception of Administrative and General costs. These were revised downward since the publication of Ref. 2.

The use of Pascal with the Apple II Plus microcomputer placed constraints on program and procedure sizes. Although these constraints are not present with OMCOST using BASIC on the IBM PC, the program structures from the Apple-II plus version have been retained. In the interest of keeping program size within bounds, separate models were developed for the PWR plant and coal-fired plants with wet FGD and dry FGD systems. The present arrangement requires that the user specify the model to be executed.

In OMCOST, a table of staff requirements is printed out for the plant type selected the first time a particular plant type is selected. This detailed table showing number of persons in the plant manager's office, operations, maintenance, and technical and engineering is not included in these BASIC models. Only the subtotals required to calculate on-site staff costs, maintenance material costs, and cost of off-site support services are included. The input data variables from OMCOST used to set wage rate, percentage operator fringe benefits, and plant supervision percentage are not input data variables in the BASIC programs. The program must be edited if these changes are required. The 1983 costs are adjusted by an appropriate escalation rate to convert the costs to the year under study.

Maintenance materials are assumed to have a cost proportional to maintenance staff with factors included to determine the fixed and variable portions of materials.

Supplies and expenses include consumables (such as water, lubricants, chemicals, gases, office supplies), radioactive and non-radioactive waste management, FGD reagent (lime or limestone), and data processing services. Supplies and expenses have fixed and variable components. It is assumed that there are no economies of scale for fixed supplies in multiple-unit plants, therefore an annual dollar amount is assigned for fixed supplies. PWR values are about double those for coal-fired plants. There is a basic variable supplies calculation for each plant type in which a given mills/kWh constant is multiplied by the annual net generation. There are adders for the coal-fired plant accounts for reagent cost and ash and sludge disposal cost.

The PWR model assumes the requirement of safety, environmental, and health physics inspections. These fees vary linearly with the number of units per plant. Costs of activities by personnel not assigned full time to the plant site are included as Off-site Support Services.

The Administrative and General category contains overhead costs including administrative and general salaries, legal expenses, payment for outside services not applicable to direct accounts, pensions, and insurance (including nuclear liability). The administrative and general

expense is assumed to be 15% of direct costs for PWR plants and 10% of direct costs for coal-fired plants. The insurance expenses are all either linear or constant functions of the number of units per plant.

For most applications of the BASIC O&M cost models it is assumed that one escalation rate will be sufficient for all cost categories. Although the BASIC models include individual escalation rates for wages, materials, supplies, and various types of insurance, the user cannot enter these individual rates through menu input. A user wishing to investigate a change in a specific escalation rate (such as wages) must edit the program. Editing is also required to change the basic wage rates, fringe benefit and supervision percentages, cost of lime or limestone, sulfur removal percentage, and ash disposal cost.

4.3 Nuclear Fuel Cycle Cost

The nuclear fuel cycle cost code is a simplified version of the REFCO code described in Ref. 3. In its present form, the BASIC nuclear fuel cycle program NFUEL can only be applied to a once-through PWR cycle. Recycle is possible if the required input data is provided and the mass balance is adjusted, but the mass balance change will involve editing of the program. Costs may be adjusted for year of startup, capacity factor, lead and lag times, inflation rate, effective cost of capital, and tax rates. The unit cost for each component of the fuel cycle may be changed as may the ecalation rate for each component. The components considered are the cost of U_3O_8, conversion, enrichment, plutonium, fabrication, reprocessing, and waste disposal. Uranium, conversion, and enrichment credits for discharged fuel are set equal to zero as are plutonium sales and reprocessing costs, thus there are provisions for more cost components than are presently used. Material losses during the various processing steps are considered. Any of the cost categories may be expensed, capitalized, or proportioned to production. Tax depreciation is assumed to be proportional to the energy generated by a batch within a period or cycle. Batch costs are accumulated to determine total life cycle cost. REFCO-83 User's Manual (Ref. 3) provides information of value to the BASIC NFUEL program. The output does not

provide a complete list of all variables used. It is necessary to refer to a listing of the program to determine characteristics of the fuel cycle being costed.

4.4 Coal Fuel Cost

The coal cost code COALCO employs the method illustrated in Ref. 4. The user inputs a coal price in dollars per million Btu, a reference year for coal price input, the year of plant startup, the plant life, the effective cost of capital, the overall inflation rate, the real cost escalation rate, and the plant net heat rate in Btu/kWh. Output consists of the constant dollar levelized coal cost in mills/kWh. The differential escalation factor used in the calculation of levelized cost is derived in Appendix C of Ref. 4.

4.5 Fixed Charge Rate

The levelized fixed charge rate code FCRATE is based on the methodology described in Ref. 4. The user inputs the project life and levelizing period, a general inflation factor, an interim replacement escalation factor, the effective tax rate (combined state and federal), capital investment cost, the tax deductible fraction of the capital investment cost (ratio of direct and indirect costs other than capitalized interest to total capitalized cost including interest), the investment tax credit rate, capital rates and ratios, and the tax depreciation schedule to be used. The user has the option of including or excluding year-by-year printout of return, rate base, taxes, and revenue requirements. Both current dollar and constant dollar rates are displayed.

4.6 Levelized Cost

The levelized cost code LEVEL is based on the methodology developed in Ref. 4. The method uses the discounted cash flow approach, whereby levelized life cycle costs are obtained. The results are expressed in both constant and current dollars. Levelized constant dollars or current dollars may be used as figures of merit for comparison of the

overall attractiveness of competing alternatives. LEVEL does not show year-by-year revenue requirements.

The levelized costs may be expressed in dollars indexed to a reference year's buying power (constant dollar) or in terms of a levelized cost, which remains constant over the life of the plant but which is calculated using mixed years' dollars (current dollar). The calculations are performed in current dollars and then converted to constant dollars. The user is referred to Ref. 4 for a discussion of the mathematical basis and relationship between constant and current dollar levelized costs.

5. INPUT DATA FOR SAMPLE PROBLEMS

To determine cost of power for a PWR plant, it is necessary to run the capital investment cost model PWRCAP, the O&M cost model PWROM, the fuel cycle cost model NFUEL, the fixed charge rate model FCRATE, and the levelized cost model LEVEL. The following input data reproduces the sample problem output as given in Appendix A. The numbers to the right of the word description indicate those models which require the data. The key to the models is as follows:

1 = PWRCAP
2 = PWROM
3 = NFUEL
4 = FCRATE
5 = LEVEL
6 = COACAP
7 = WETOM
8 = COALCO

As an example, year of first commercial operation, which is followed by 1, 3, and 5, is used in PWRCAP, NFUEL, and LEVEL.

```
YEAR OF STEAM SUPPLY SYSTEM PURCHASE (1)
  1987
YEAR OF CONSTRUCTION PERMIT (1)
  1989
YEAR OF FIRST COMMERCIAL OPERATION (1, 3, 5)
  1995
INTEREST RATE DURING CONSTRUCTION (PCT/YR) (1)
  9.0
ESCALATION RATE DURING CONSTRUCTION (PCT/YR) (1)
  7.0
CONTINGENCY (PCT) (1)
  10.0
NET RATING PER UNIT (MWE) (1, 2, 5)
  1100
CITY NUMBER (1)
  5     (CHICAGO)
NUMBER OF UNITS PER PLANT (2, 5)
  1
BASE LOAD CAPACITY FACTOR (DECIMAL) (2, 3, 5)
  0.65
O&M COST ESCALATION RATE (PCT/YR) (2)
  6.0
PLANT NET HEAT RATE (BTU/KWH) (2)
  10200
```

```
LAG TIME FOR RECEIPTS (YEARS) (3)
  0.50
CREDIT FOR DISCHARGED FISSILE? (3)
  NO
GNP INFLATION RATE (DECIMAL) (3, 5)
  0.06
EFFECTIVE COST OF MONEY (DECIMAL) (3)
  0.090
COMBINED STATE & FEDERAL INCOME TAX RATE (DECIMAL) (3, 4)
  0.4816
BASE YEAR FOR FUEL COST DATA (3)
  1983
REFERENCE YEAR PRICE FOR U3O8 ($/LB) (3)
  34.00
REFERENCE YEAR PRICE FOR CONVERSION ($/KG) (3)
  8.00
REFERENCE YEAR PRICE FOR ENRICHMENT ($/SWU) (3)
  139.00
REFERENCE YEAR PRICE FOR PLUTONIUM ($/GM) (3)
  0.0
REFERENCE YEAR PRICE FOR FABRICATION ($/KG) (3)
  200.00
BACK END (REPROCESSING) ($/KG) (3)
  0.0
WASTE DISPOSAL (MILLS/KWH) (3)
  1.0
PRICE ESCALATION RATE U3O8 (DECIMAL) (3)
  0.079
PRICE ESCALATION RATE CONVERSION (DECIMAL) (3)
  0.06
PRICE ESCALATION RATE ENRICHMENT (DECIMAL) (3)
  0.043
PRICE ESCALATION RATE PLUTONIUM (DECIMAL) (3)
  0.06
PRICE ESCALATION RATE FABRICATION (DECIMAL) (3)
  0.06
PRICE ESCALATION RATE BACK END, REPROCESSING (DECIMAL) (3)
  0.06
PRICE ESCALATION RATE WASTE DISPOSAL (DECIMAL) (3)
  0.06
YEAR-BY-YEAR PRINTOUT REQUESTED (4)
  Y
LEVELIZING PERIOD (YEARS) (4)
  30
INFLATION FACTOR (1 + DECIMAL RATE) (4)
  1.06
INTERIM REPLACEMENT ESCALATION FACTOR (1 + DECIMAL RATE) (4)
  1.06
TOTAL INITIAL CAPITAL INVESTMENT (4)
  1000
TAX DEDUCTIBLE FRACTION OF TOTAL CAPITAL INVESTMENT (4)
  0.729
```

```
INVESTMENT TAX CREDIT RATE (4)
  0.08
PROPERTY TAX RATE (4)
  0.02
INTERIM REPLACEMENT RATE (4)
  0.005
NORMALIZED OR FLOW-THROUGH ACCOUNTING (4)
  N
TEFRA DEPRECIATION SCHEDULE (4)
  10-YEAR PROPERTY
PLANT TYPE (5)
  N     (NUCLEAR)
PLANT LIFE (YEARS) (4, 5)
  30
REAL (DIFFERENTIAL) COST ESCALATION RATE (DECIMAL) (5)
  0.01
STATE INCOME TAX RATE (DECIMAL) (5)
  0.04
FEDERAL INCOME TAX RATE (DECIMAL) (5)
  0.46
RETURN ON COMMON STOCK (DECIMAL) (4, 5)
  0.14
COMMON STOCK FRACTION (4, 5)
  0.38
INTEREST RATE ON DEBT (DECIMAL) (4, 5)
  0.10
DEBT FRACTION (4, 5)
  0.50
RETURN ON PREFERRED STOCK (DECIMAL) (4, 5)
  0.09
CONSTANT DOLLAR LEVELIZED COST YEAR (2, 5)
  1983.0
FIXED CHARGE RATE (DECIMAL, CURRENT DOLLAR) (5)
  0.167
PLANT INVESTMENT COST AT FIRST COMMERCIAL OPERATION
FOR ALL UNITS (from PWRCAP) ($MILLIONS) (5)
  3398.0
FEDERAL GOVERNMENT DEBT RATE FOR DECOMMISSIONING
FUNDS (DECIMAL) (5)
  0.085
DECOMMISSIONING COST IN CONSTANT DOLLAR LEVELIZED
COST YEAR ($MILLIONS) (5)
  130.0
O&M COST IN CONSTANT DOLLAR LEVELIZED COST YEAR
(from PWROM) (MILLS/KWH) (5)
  6.61
FUEL COST IN CONSTANT DOLLAR LEVELIZED COST YEAR
COST DATA (from NFUEL) (MILLS/KWH) (5)
  8.78
```

To determine cost of power generation for a coal-fired plant, the user may execute the capital investment cost model COACAP, one of the O&M cost models (WETOM or DRYOM), the coal cost model COALCO, the fixed charge rate model FCRATE, and then the levelized cost model LEVEL. The following input data reproduces the sample output as given in Appendix B.

```
YEAR OF STEAM SUPPLY SYSTEM PURCHASE (6)
  1989
YEAR OF CONSTRUCTION PERMIT (6)
  1991
YEAR OF FIRST COMMERCIAL OPERATION (5, 6, 8)
  1995
INTEREST RATE DURING CONSTRUCTION (PCT/YR) (6)
  9.0
ESCALATION RATE DURING CONSTRUCTION (PCT/YR) (6)
  7.0
CONTINGENCY (PCT) (6)
  10.0
NET RATING PER UNIT (MWE) (5, 6, 7)
  550
CITY NUMBER (6)
  5      (CHICAGO)
NUMBER OF UNITS PER PLANT (5, 7)
  2
BASE LOAD CAPACITY FACTOR (DECIMAL) (5, 7)
  0.65
O&M COST ESCALATION RATE (PCT/YR) (7)
  6.0
PLANT NET HEAT RATE (BTU/KWH) (7, 8)
  9900
SULFUR (PERCENT) (7)
  3.5
ASH (PERCENT) (7)
  11.6
HEATING VALUE (BTU/LB) (7)
  11000.0
REFERENCE YEAR FOR PRICE OF COAL (8)
  1983
PRICE OF COAL ($/MBTU) (8)
  1.60
COAL REAL COST ESCALATION RATE (DECIMAL) (8)
  0.015
EFFECTIVE COST OF MONEY (DECIMAL) (8)
  0.09
YEAR-BY-YEAR PRINTOUT REQUESTED (4)
  Y
LEVELIZING PERIOD (YEARS) (4)
  30
```

INFLATION FACTOR (1 + DECIMAL RATE) (4)
1.06
INTERIM REPLACEMENT ESCALATION FACTOR (1 + DECIMAL RATE) (4)
1.06
COMBINED FEDERAL AND STATE INCOME TAX RATE (DECIMAL) (4)
0.4816
TOTAL INITIAL CAPITAL INVESTMENT (4)
1000
TAX DEDUCTIBLE FRACTION OF TOTAL CAPITAL INVESTMENT (4)
0.798
INVESTMENT TAX CREDIT RATE (4)
0.08
PROPERTY TAX RATE (4)
0.02
INTERIM REPLACEMENT RATE (4)
0.005
NORMALIZED OR FLOW-THROUGH ACCOUNTING (4)
N
TEFRA DEPRECIATION SCHEDULE (4)
15-YEAR PUBLIC UTILITY PROPERTY
PLANT TYPE (5)
C (COAL-FIRED)
PLANT LIFE (YEARS) (4, 5, 8)
30
GNP INFLATION RATE (DECIMAL) (5, 8)
0.06
REAL (DIFFERENTIAL) COST ESCALATION RATE (DECIMAL) (5)
0.01
STATE INCOME TAX RATE (DECIMAL) (5)
0.04
FEDERAL INCOME TAX RATE (DECIMAL) (5)
0.46
RETURN ON COMMON STOCK (DECIMAL) (4, 5)
0.14
COMMON STOCK FRACTION (4, 5)
0.38
INTEREST RATE ON DEBT (DECIMAL) (4, 5)
0.10
DEBT FRACTION (4, 5)
0.50
RETURN ON PREFERRED STOCK (DECIMAL) (4, 5)
0.09
CONSTANT DOLLAR LEVELIZED COST YEAR (5, 7)
1983.0
FIXED CHARGE RATE (DECIMAL, CURRENT DOLLAR) (5)
0.169
PLANT INVESTMENT COST AT FIRST COMMERCIAL OPERATION
FOR ALL UNITS (from COACAP) ($MILLIONS) (5)
2763.0
O&M COST IN CONSTANT DOLLAR LEVELIZED COST YEAR
(from WETOM) (MILLS/KWH) (5)
5.17

FUEL COST IN CONSTANT DOLLAR LEVELIZED COST YEAR COST DATA (MILLS/KWH) (5)
23.4

6. JOB SUBMISSION TO THE IBM PC

It is assumed that the user has an IBM Personal Computer system with system unit (containing two 5-1/4 in. diskette drives), a keyboard unit, and a printer. These programs were developed using BASICA (advanced basic) on Disk Operating System (DOS) Version 3.00.

Use of these programs requires that DOS first be brought up. If power to the system unit is off, DOS can be inserted in drive A, power can be turned on, and DOS will be automatically loaded into memory after the internal power-on self-test is performed. After DOS is loaded, a request to enter new date and time will appear. Two lines of information concerning the DOS version and a copyright notice will also appear. The DOS prompt A> will then be displayed.

The disk containing the ten cost programs may then be inserted in drive B. Entering the command DIR B: causes all directory entries on the cost diskette to be displayed.

The diskette contains ten programs, which are identified as PWRCAP, COACAP, CAPCOS, PWROM, WETOM, DRYOM, COALCO, NFUEL, FCRATE, and LEVEL. Advanced basic may be loaded by entering the word BASICA followed by the ENTER key. Once advanced basic has been loaded, the program function keys F1 through F10 can be used to make the PC perform predefined commands. These include LIST, RUN, LOAD, and SAVE. Use program function key F3 to load any basic programs. F3 will show LOAD on the screen. Enter B:PWRCAP (or B:PWCAP.BAS) since the basic programs reside on the diskette in drive B. Use F2 to interpret and execute PWRCAP. You will be prompted for the date in the form 12/21/84. Next the menu will appear. To reproduce the sample problem, your responses should match the previous list of input. Years may be entered as integer, fixed point, or floating point numbers. The user may try this by selecting menu item 1 and responding to YEAR OF STEAM SYSTEM PURCHASE with integer 1983, selecting menu item 2 and responding to YEAR OF CONSTRUCTION PERMIT with 1988.0, selecting menu item 3 and responding to YEAR OF COMMERCIAL OPERATION with 1.995E3.

You may continue to answer the questions following the listing above but a few words of caution are in order. There is some inconsistency in the form of input between models. Be careful to observe the prompt line for such input as interest rate. One model may prompt for percentage (i.e., 10.0) while another model may prompt for a decimal (i.e., 0.10). You may continue to check out the use of the menu using the data listed in Section 5. When the menu shows your data to be correct, enter 0, and you will be prompted for run identification. You may type in run identification followed by ENTER, or simply ENTER. Execution will begin. Check your results. If there was an error in data entry and you wish to run a corrected case, make your selection from the menu and run the case by typing a 0. When your output is just the way you want it, enter 99 to exit the PWR capital investment cost program.

OK now appears at the top of the screen. To select another program, use function key F3. Load B:PWROM then use F2 to execute PWROM. You are again prompted for the date. The menu for the PWR O&M cost program is self explanatory except that if levelized cost is to be calculated later using LEVEL, constant dollar levelized cost year should be input as the YEAR OF OPERATION. Although the plant may be operated in 1995, levelized costs in 1983 dollars will be calculated using 1983 O&M costs as input. Model LEVEL takes the operation and maintenance cost for 1983 and inflates it as required to the actual year or years of operation (1995 and beyond). The reference to year of operation is for use of PWROM as a stand-alone O&M cost code where cost for a specific year is normally desired.

If the user selects menu item 5, he is asked if he wants to use the default general escalation rate. If the answer is N for no, the user is asked if he wants to input a general escalation rate. If the answer to this is also N, a series of individual escalation rates which have previously been assigned within the model will be used. For the PWROM model the escalation rates include wages, commercial liability insurance, government liability insurance, cost of fees, inspections, reviews, materials, supplies and expenses, property insurance, and replacement power insurance. Any of these values can be changed by editing a program but may not be changed through use of the menu.

Note that the BASE LOAD CAPACITY FACTOR prompted for should be input as a decimal (i.e., 0.65) rather than as a percentage. Compare the values shown on the menu with the sample data previously listed. When you are satisfied that the input matches the sample input data, type 0 to run the case, compare the output against the sample output, if it is satisfactory type 99 and we will proceed to the fuel cycle cost code NFUEL.

OK now appears at the top of the screen. Select B:NFUEL by use of the function key F3. Use F2 to begin execution. The sample case may be reproduced using the default data by typing 0 with no data changes. When it prompts for YEAR OF STARTUP, this is synonymous with YEAR OF FIRST COMMERCIAL OPERATION. Capacity factor is input as a decimal, not a percentage. Again, be sure that the printer is turned on. Turning the printer off will leave the monitor in an apparent hung condition until the printer is turned on. The LAG TIME FOR RECEIPTS of revenues may be input as a decimal fraction of a year or as a real or integer value greater than 1 year. CREDIT FOR DISCHARGED FISSILE (Y OR N) questions whether a credit should be included for plutonium and uranium recovered in reprocessing. It should be noted that the reference year price for plutonium defaults to zero.

The inflation rate called for in menu item 5 is a decimal estimate of the Gross National Product Implicit Price Deflator over the plant lifetime. The EFFECTIVE COST OF MONEY is the weighted-average after tax cost of capital considered to consist of common stock, preferred stock, and debt. Program LEVEL uses individual fractions and returns for each capital component and the marginal tax rate to calculate the effective cost of money. NFUEL assumes that the after tax cost of capital is known. It is suggested that the user of NFUEL might want to start with an estimated cost of money, then adjust the results after running LEVEL. Item 7, INCOME TAX RATE, is the combined state and federal rate, which is calculated in LEVEL from state and federal income tax rates.

Reference year prices (menu items 9 through 15) prompt for the correct units of price. The PRICE ESCALATION RATES called for represent the combination of the inflation rate and a real cost escalation rate. It should be noted that all reference prices other than U_3O_8 and

enrichment are assumed to rise in line with the general inflation rate. Compare the output with the sample case. If it is satisfactory, type 99 and proceed to the levelized cost code. Load B:LEVEL by using function key F3. Execute by use of F2. LEVEL applies to both LWR and coal-fired plants, therefore menu item 1 calls for plant type as either N for nuclear or C for coal-fired. Plant type defaults to nuclear. While the capital investment cost code printed costs for one through four units for all runs, LEVEL requires that the user input the number of units or accept the default values of single unit for LWR or two units for coal-fired plants. The inflation and escalation rates called for are the expected change in the Gross National Product Implicit Price Deflator and the real (differential) escalation rate. Financial returns and capitalization fractions are those required to calculate effective (after tax) cost of money.

It is suggested that the user might want to make a first run using default data (type 0) followed by a practice case with the maximum amount of input. Input each menu item number and respond with the data from Sect. 5. Note that plant type must be entered in upper case (N or C). Menu item 99 exits the program. The results of both of the above cases should be identical and should agree with the sample output included in Appendices A and B. Compare your output with the sample output. Careful inspection of the output should enable you to find any differences and rerun to produce identical output.

It was pointed out earlier that the BASIC programs do not ask for as much input data as the original IBM Fortran programs. It was also pointed out that the variables do exist within the BASIC programs to change many other variables from the IBM routines. The CONCEPT Fortran program and the REFCO Fortran program were too large to be translated directly to BASIC, but the OMCOST Fortran program allowed for direct translation into three BASIC programs.

Appendix A

SAMPLE PROBLEM OUTPUT FOR PWR PLANT

C A P I T A L C O S T E S T I M A T E

VERSION 1/8/85
RUN DATE 1/14/85

SAMPLE PROBLEM
EEDB PHASE VI, 1/83 REGULATORY STATUS
PWR POWER PLANT

YEAR OF STEAM SUPPLY SYSTEM PURCHASE		1987
YEAR OF CONSTRUCTION PERMIT		1989
YEAR OF COMMERCIAL OPERATION		1995
INTEREST RATE DURING CONSTRUCTION (pct/yr)		9
ESCALATION RATE (percent/year)		7
CONTINGENCY (percent)		10
NET RATING PER UNIT (MWe)		1100
PLANT LOCATION	CHICAGO	
DIRECT COSTS ($MILLIONS)		
20 LAND	7	
21 STRUCTURES	239	
22 REACTOR PLANT	329	
23 TURBINE PLANT	264	
24 ELECTRIC PLANT	93	
25 MISC PLANT	53	
26 MAIN COND HEAT REJ	51	
SUBTOTAL DIRECTS		1036
INDIRECT COSTS		
91 CONSTR SERVICES	212	
92 HOME OFFICE ENGRG	229	
93 FIELD OFFICE	127	
94 OWNER COSTS	80	
SUBTOTAL INDIRECTS		649
SUBTOTAL DIRECTS AND INDIRECTS		1685
CONTINGENCY ALLOWANCE		169
TOTAL DIRECT AND INDIRECT COSTS BEFORE ESC.		1854
ESCALATION DURING CONSTRUCTION		640
TOTAL ESCALATED DIRECT AND INDIRECT COSTS		2494
TOTAL INTEREST DURING CONSTRUCTION		924
TOTAL CAPITAL INVESTMENT MIDDLETOWN		3418
PLANT LOCATION ADJUSTMENT CHICAGO		-20
1 UNIT PLANT CAPITAL INVESTMENT	(3089 $/kWe)	3398
2 UNIT PLANT CAPITAL INVESTMENT	(2656 $/kWe)	5843
3 UNIT PLANT CAPITAL INVESTMENT	(2522 $/kWe)	8324
4 UNIT PLANT CAPITAL INVESTMENT	(2456 $/kWe)	10805

SUMMARY OF ANNUAL NONFUEL O&M COST FOR PWR POWER PLANT

VERSION 1/10/85
RUN DATE 1/14/85

SAMPLE PROBLEM		
NET RATING OF EACH UNIT (MWe)	1100	
NUMBER OF UNITS PER PLANT	1	
BASE LOAD CAPACITY FACTOR	.65	
ESCALATION RATE (percent/year)	6.00	
THERMAL INPUT PER UNIT (MWt)	3288	
PLANT NET HEAT RATE (BTU/kWh)	10200	
PLANT NET EFFICIENCY (percent)	33.5	
ANNUAL NET GENERATION (million kWh)	6268	
YEAR OF ESTIMATE	1983	
DIRECT COSTS ($million/year)		
STAFF ONSITE	15.72	
(401 PERSONS AT $39191)		
MAINTENANCE MATERIAL	4.56	
FIXED		3.59
VARIABLE		0.97
SUPPLIES AND EXPENSES	5.75	
FIXED		5.09
VARIABLE		0.66
FEES, INSPECTIONS, REVIEWS	0.52	
OFFSITE SUPPORT SERVICES	3.92	
INDIRECT COSTS ($million/year)		
ADMINISTRATIVE AND GENERAL	10.94	
COMMERCIAL LIABILITY INSURANCE		0.42
RETROSPECTIVE PREMIUM		0.01
PROPERTY INSURANCE (PRIMARY)		2.12
PROPERTY INSURANCE (EXCESS)		1.70
REPLACEMENT POWER INSURANCE		2.12
OTHER A&G		4.57
COSTS ($million/year)		
TOTAL FIXED DIRECTS AND INDIRECTS		39.8
TOTAL VARIABLE DIRECTS AND INDIRECTS		1.6
TOTAL NONFUEL O&M		41.4
UNIT COSTS (mills/kWh)		
FIXED DIRECTS AND INDIRECTS		6.34
VARIABLE DIRECTS AND INDIRECTS		0.26
TOTAL NONFUEL O&M		6.61

N U C L E A R F U E L C Y C L E C O S T

VERSION 1/10/85
RUN DATE 1/14/85

INPUT DATA

SAMPLE PROBLEM	
YEAR OF STARTUP	1995
CAPACITY FACTOR	0.65
LAG TIME (years)	0.5
NO CREDIT FOR DISCHARGED FISSILE	
BASE YEAR FOR COST DATA	1983
INFLATION RATE	0.06
EFFECTIVE COST OF MONEY	.0900
INCOME TAX RATE	.4816
REFERENCE YEAR PRICES	
U308 ($/lb)	34.00
CONVERSION ($/kg)	8.00
ENRICHMENT ($/SWU)	139.00
PLUTONIUM ($/gm)	0.00
FABRICATION ($/gm)	200.00
BACK END (reprocessing) ($/kg)	0.00
WASTE DISPOSAL (mills/kWh)	1.00
PRICE ESCALATION RATES	
U308	.079
CONVERSION	.060
ENRICHMENT	.043
PLUTONIUM	.060
FABRICATION	.060
BACK END (reprocessing)	.060
WASTE DISPOSAL	.060

LEVELIZED FUEL CYCLE COSTS, MILLS/KWH

	CURRENT DOLLARS	CONSTANT DOLLARS
URANIUM PURCHASE	16.446	4.191
CONVERSION PURCHASE	0.957	0.244
ENRICHMENT PURCHASE	8.814	2.246
PLUTONIUM PURCHASE	0.000	0.000
FABRICATION	4.325	1.102
URANIUM CREDIT	0.000	0.000
CONVERSION CREDIT	0.000	0.000
ENRICHMENT CREDIT	0.000	0.000
PLUTONIUM SALES	0.000	0.000
REPROCESSING	0.000	0.000
WASTE DISPOSAL	3.923	1.000
	34.466	8.782

F I X E D C H A R G E R A T E

VERSION 1/10/85
RUN DATE 1/14/85

PWR SAMPLE PROBLEM

INPUT DATA

PROJECT LIFE (years)	30
LEVELIZING PERIOD (years)	30
INFLATION FACTOR (1 + rate)	1.06
INTERIM REPLACEMENT ESCALATION FACTOR (1 + rate)	1.06
EFFECTIVE INCOME TAX RATE	.4816
TOTAL INITIAL CAPITAL INVESTMENT (dollars)	1000
TAX DEDUCTABLE FRACTION OF TOTAL CAPITAL INVEST.	.7290
INVESTMENT TAX CREDIT RATE	0.08
INTEREST RATE ON DEBT	.1000
RETURN ON PREFERRED STOCK	.0900
RETURN ON COMMON STOCK	.1400
DEBT FRACTION	.5000
PREFERRED STOCK FRACTION	.1200
COMMON STOCK FRACTION	.3800
PROPERTY TAX RATE	0.02
INTERIM REPLACEMENT RATE	0.005

NORMALIZED ACCOUNTING
ACRS CLASS: 10-YEAR PROPERTY

YR	RATE BASE	RETURN ON CAP	BOOK DEPR	TAX DEPR	I TAX CURR	I TAX DEFER	PROP TAX	INTRM REPL	REV R CURR	REV R CONST
1	942	107	33	58	48	16	20	5	230	217
2	894	102	33	102	24	37	20	6	222	198
3	825	94	33	87	27	30	20	6	211	177
4	763	87	33	73	30	23	20	6	200	159
5	708	81	33	73	27	23	20	7	191	143
6	654	75	33	73	24	23	20	7	182	128
7	599	68	33	66	24	20	20	8	173	115
8	548	62	33	66	21	20	20	8	165	103
9	496	57	33	66	18	20	20	8	156	92
10	445	51	33	66	15	20	20	9	148	83
11	394	45	33	0	44	-12	20	9	140	73
12	374	43	33	0	42	-12	20	10	137	68
13	354	40	33	0	41	-12	20	11	134	63
14	335	38	33	0	40	-12	20	11	131	58
15	315	36	33	0	39	-12	20	12	128	54
16	295	34	33	0	38	-12	20	13	126	49
17	276	31	33	0	36	-12	20	13	123	46
18	256	29	33	0	35	-12	20	14	120	42
19	236	27	33	0	34	-12	20	15	118	39
20	217	25	33	0	33	-12	20	16	115	36
21	197	22	33	0	32	-12	20	17	113	33
22	177	20	33	0	31	-12	20	18	110	31
23	157	18	33	0	29	-12	20	19	108	28
24	138	16	33	0	28	-12	20	20	106	26
25	118	13	33	0	27	-12	20	21	104	24
26	98	11	33	0	26	-12	20	23	102	22
27	79	9	33	0	25	-12	20	24	99	21
28	59	7	33	0	24	-12	20	26	98	19
29	39	4	33	0	22	-12	20	27	96	18
30	20	2	33	0	21	-12	20	29	94	16

SUM OF THE PRESENT WORTH OF REVENUE REQUIREMENTS AT

8.99 PERCENT COST OF MONEY 1718

2.82 PERCENT COST OF MONEY 1718

FIXED CHARGE RATE

CURRENT DOLLAR RATE = .1671
CONSTANT DOLLAR RATE = .0857

L E V E L I Z E D P O W E R G E N E R A T I O N C O S T

VERSION 1/14/85
RUN DATE 1/14/85

PWR SAMPLE PROBLEM

PLANT TYPE	NUCLEAR
YEAR OF FIRST COMMERCIAL OPERATION	1995
RATING PER UNIT (MWe)	1100
UNITS PER PLANT	1
PLANT LIFE	30
GNP INFLATION RATE	0.06
STATE INCOME TAX RATE	0.04
FEDERAL INCOME TAX RATE	0.46
EFFECTIVE INCOME TAX RATE	0.4816
RETURN ON COMMON STOCK	0.14
COMMON STOCK FRACTION	0.38
INTEREST RATE ON DEBT	0.10
DEBT FRACTION	0.50
RETURN ON PREFERRED STOCK	0.09
PREFERRED STOCK FRACTION	0.12
EFFECTIVE COST OF MONEY	.0899
CONSTANT DOLLAR LEVELIZED COST YEAR	1983
FIXED CHARGE RATE	0.167
PLANT INVESTMENT COST (1995 $millions)	3398
CAPACITY FACTOR	0.65
FEDERAL GOVERNMENT DEBT RATE	0.085
DECOMMISSIONING COST (1983 $millions)	130
LEVELIZED O&M COST (1983 mills/kWh)	6.61
LEVELIZED FUEL COST (1983 mills/kWh)	8.78

LEVELIZED POWER GENERATION COSTS (mills/kWh)

	CONSTANT	CURRENT
CAPITAL	23.1	90.7
O&M	6.6	25.9
FUEL	8.8	34.5
DECOM.	0.5	1.9
	39.0	153.0

C A P I T A L C O S T E S T I M A T E

VERSION 1/10/85
RUN DATE 1/14/85

SAMPLE PROBLEM
EEDB PHASE VI, 1/83 REGULATORY STATUS

PLANT TYPE	NUCLEAR
YEAR OF STEAM SUPPLY SYSTEM PURCHASE	1987
YEAR OF CONSTRUCTION PERMIT	1989
YEAR OF COMMERCIAL OPERATION	1995
INTEREST RATE DURING CONST. (percent/year)	9
ESCALATION RATE (percent/year)	7
CONTINGENCY (percent)	10
NET RATING PER UNIT (MWe)	1100
PLANT LOCATION	CHICAGO
BASE YEAR FOR DIRECT AND INDIRECT COST INPUT	1987
BASE SIZE FOR DIRECT AND INDIRECT COST INPUT	1100
DIRECT COST AT BASE SIZE/YEAR ($millions)	1036
INDIRECT COST AT BASE SIZE/YEAR ($millions)	649

OVERNIGHT COSTS (year SSS purchase, $millions)	
DIRECT COSTS	1036
INDIRECT COSTS	649
SUBTOTAL DIRECT AND INDIRECT COSTS	1685
CONTINGENCY ALLOWANCE	169
TOTAL DIR. AND INDIR. COST BEFORE ESC.	1854
ESCALATION DURING CONSTRUCTION	640
TOTAL ESCALATED DIRECT AND INDIRECT COSTS	2494
TOTAL INTEREST DURING CONSTRUCTION	924
TOTAL PLANT CAPITAL INVESTMENT MIDDLETOWN	3418
PLANT LOCATION ADJUSTMENT CHICAGO	-20
1 UNIT PLANT CAPITAL INVESTMENT (3089 $/kWe)	3398
2 UNIT PLANT CAPITAL INVESTMENT (2656 $/kWe)	5843
3 UNIT PLANT CAPITAL INVESTMENT (2522 $/kWe)	8324
4 UNIT PLANT CAPITAL INVESTMENT (2456 $/kWe)	10804

Appendix B

SAMPLE PROBLEM OUTPUT FOR COAL-FIRED PLANT

C A P I T A L C O S T E S T I M A T E

VERSION 1/8/85
RUN DATE 1/14/85

SAMPLE PROBLEM
EEDB PHASE VI, 1/83 REGULATORY STATUS
COAL-FIRED POWER PLANT

YEAR OF STEAM SUPPLY SYSTEM PURCHASE	1989
YEAR OF CONSTRUCTION PERMIT	1991
YEAR OF COMMERCIAL OPERATION	1995
INTEREST RATE DURING CONST. (percent/year)	9
ESCALATION RATE (percent/year)	7
CONTINGENCY (percent)	10
NET RATING PER UNIT (MWe):	550
PLANT LOCATION	CHICAGO

DIRECT COSTS ($millions)		
20 LAND	8	
21 STRUCTURES	101	
22 BOILER PLANT	335	
23 TURBINE PLANT	135	
24 ELECTRIC PLANT	59	
25 MISC PLANT	33	
26 MAIN COND HEAT REJ	29	
SUBTOTAL DIRECTS		700
INDIRECT COSTS		
91 CONSTR SERVICES	68	
92 HOME OFFICE ENGRG	35	
93 FIELD OFFICE	29	
94 OWNER COSTS	83	
SUBTOTAL INDIRECTS		213
SUBTOTAL DIRECT AND INDIRECT		913
CONTINGENCY ALLOWANCE		91
TOTAL DIRECT AND INDIRECT BEFORE ESCALATION		1004
ESCALATION DURING CONSTRUCTION		264
TOTAL ESCALATED DIRECT AND INDIRECT COSTS		1269
TOTAL INTEREST DURING CONSTRUCTION		316
TOTAL CAPITAL INVESTMENT MIDDLETOWN		1584
PLANT LOCATION ADJUSTMENT CHICAGO		-9

1 UNIT PLANT CAPITAL INVESTMENT	(2864 $/kWe)	1575
2 UNIT PLANT CAPITAL INVESTMENT	(2512 $/kWe)	2763
3 UNIT PLANT CAPITAL INVESTMENT	(2394 $/kWe)	3951
4 UNIT PLANT CAPITAL INVESTMENT	(2336 $/kWe)	5139

SUMMARY OF ANNUAL NONFUEL O&M COST FOR COAL-FIRED
POWER PLANT WITH WET LIMESTONE FGD SYSTEM

VERSION 1/10/85
RUN DATE 1/14/85

SAMPLE PROBLEM		
NET RATING OF EACH UNIT (MWe)	550	
NUMBER OF UNITS PER PLANT	2	
BASE LOAD CAPACITY FACTOR	.65	
ESCALATION RATE (percent/year)	6.00	
SULFUR (percent)	3.5	
ASH (percent)	11.6	
HEATING VALUE (BTU/lb)	11000	
THERMAL INPUT PER UNIT (MWt)	1596	
PLANT NET HEAT RATE (BTU/kWh)	9900	
PLANT NET EFFICIENCY (percent)	34.5	
ANNUAL NET GENERATION (million kWh)	6268	
YEAR OF ESTIMATE	1983	
DIRECT COSTS ($million/year)		
STAFF ONSITE	10.09	
(295 PERSONS AT $34215)		
MAINTENANCE MATERIAL	4.23	
FIXED		3.35
VARIABLE		0.88
SUPPLIES AND EXPENSES	13.79	
FIXED		4.66
VARIABLE - PLANT		0.80
- LIMESTONE		4.71
- ASH, FGD SLUDGE		3.62
OFFSITE SUPPORT SERVICES	1.18	
INDIRECT COSTS ($million/year)		
ADMINISTRATIVE AND GENERAL	3.14	
PROPERTY INSURANCE		0.21
OTHER A&G		2.93
COSTS ($million/year)		
TOTAL FIXED DIRECTS AND INDIRECTS		22.4
TOTAL VARIABLE DIRECTS AND INDIRECTS		10.0
TOTAL NONFUEL O&M		32.4
UNIT COSTS (mills/kWh)		
FIXED DIRECTS AND INDIRECTS		3.58
VARIABLE DIRECTS AND INDIRECTS		1.60
TOTAL NONFUEL O&M		5.17

L E V E L I Z E D C O A L C O S T

VERSION 1/10/85
RUN DATE 1/14/85

INPUT DATA

SAMPLE PROBLEM	
REFERENCE YEAR FOR PRICE OF COAL	1983
PRICE OF COAL IN DOLLARS PER MILLION BTU	1.6
YEAR OF PLANT STARTUP	1995
PLANT LIFE	30
GNP INFLATION RATE	0.060
REAL COST ESCALATION RATE	0.015
EFFECTIVE COST OF MONEY	0.090
PLANT NET HEAT RATE (Btu/kWh)	9900

CONSTANT DOLLAR LEVELIZED COST OF COAL IN 1983 DOLLARS
23.3 mills/kWh

F I X E D C H A R G E R A T E

VERSION 1/10/85
RUN DATE 1/14/85

COAL-FIRED SAMPLE PROBLEM

INPUT DATA

PROJECT LIFE (years)	30
LEVELIZING PERIOD (years)	30
INFLATION FACTOR (1 + rate)	1.06
INTERIM REPLACEMENT ESCALATION FACTOR (1 + rate)	1.06
EFFECTIVE INCOME TAX RATE	.4816
TOTAL INITIAL CAPITAL INVESTMENT (dollars)	1000
TAX DEDUCTABLE FRACTION OF TOTAL CAPITAL INVEST.	.7980
INVESTMENT TAX CREDIT RATE	0.08
INTEREST RATE ON DEBT	.1000
RETURN ON PREFERRED STOCK	.0900
RETURN ON COMMON STOCK	.1400
DEBT FRACTION	.5000
PREFERRED STOCK FRACTION	.1200
COMMON STOCK FRACTION	.3800
PROPERTY TAX RATE	0.02
INTERIM REPLACEMENT RATE	0.005
NORMALIZED ACCOUNTING	
ACRS CLASS: 15-YEAR PUBLIC UTILITY PROPERTY	

YR	RATE BASE	RETURN ON CAP	BOOK DEPR	TAX DEPR	I TAX CURR	I TAX DEFER	PROP TAX	INTRM REPL	REV R CURR	REV R CONST
1	936	107	33	40	56	6	20	5	227	214
2	899	102	33	80	34	26	20	6	221	197
3	842	96	33	72	35	22	20	6	212	178
4	789	90	33	64	35	18	20	6	203	161
5	740	84	33	56	36	14	20	7	195	145
6	694	79	33	56	33	14	20	7	187	132
7	649	74	33	48	35	10	20	8	180	119
8	608	69	33	48	32	10	20	8	173	109
9	566	65	33	48	30	10	20	8	166	98
10	525	60	33	48	27	10	20	9	160	89
11	483	55	33	48	25	10	20	9	153	81
12	442	50	33	48	22	10	20	10	146	73
13	400	46	33	48	20	10	20	11	140	65
14	359	41	33	48	17	10	20	11	133	59
15	317	36	33	48	15	10	20	12	127	53
16	276	31	33	0	35	-13	20	13	120	47
17	258	29	33	0	34	-13	20	13	118	44
18	239	27	33	0	33	-13	20	14	115	40
19	221	25	33	0	32	-13	20	15	113	37
20	202	23	33	0	31	-13	20	16	111	35
21	184	21	33	0	30	-13	20	17	108	32
22	166	19	33	0	29	-13	20	18	106	30
23	147	17	33	0	28	-13	20	19	104	27
24	129	15	33	0	27	-13	20	20	102	25
25	110	13	33	0	26	-13	20	21	100	23
26	92	10	33	0	25	-13	20	23	98	22
27	74	8	33	0	23	-13	20	24	96	20
28	55	6	33	0	22	-13	20	26	95	19
29	37	4	33	0	21	-13	20	27	93	17
30	18	2	33	0	20	-13	20	29	91	16

SUM OF THE PRESENT WORTH OF REVENUE REQUIREMENTS AT

8.99 PERCENT COST OF MONEY 1740

2.82 PERCENT COST OF MONEY 1740

FIXED CHARGE RATE

CURRENT DOLLAR RATE = .1693
CONSTANT DOLLAR RATE = .0868

L E V E L I Z E D P O W E R G E N E R A T I O N C O S T

VERSION 1/14/85
RUN DATE 1/14/85

COAL-FIRED SAMPLE PROBLEM

PLANT TYPE	COAL-FIRED
YEAR OF FIRST COMMERCIAL OPERATION	1995
RATING PER UNIT (MWe)	550
UNITS PER PLANT	2
PLANT LIFE	30
GNP INFLATION RATE	0.06
STATE INCOME TAX RATE	0.04
FEDERAL INCOME TAX RATE	0.46
EFFECTIVE INCOME TAX RATE	0.4816
RETURN ON COMMON STOCK	0.14
COMMON STOCK FRACTION	0.38
INTEREST RATE ON DEBT	0.10
DEBT FRACTION	0.50
RETURN ON PREFERRED STOCK	0.09
PREFERRED STOCK FRACTION	0.12
EFFECTIVE COST OF MONEY	.0899
CONSTANT DOLLAR LEVELIZED COST YEAR	1983
FIXED CHARGE RATE	0.169
PLANT INVESTMENT COST (1995 $millions)	2763
CAPACITY FACTOR	0.65
LEVELIZED O&M COST (1983 mills/kWh)	5.17
LEVELIZED FUEL COST (1983 mills/kWh)	23.40

LEVELIZED POWER GENERATION COSTS (mills/kWh)

	CONSTANT	CURRENT
CAPITAL	19.0	74.6
O&M	5.2	20.3
FUEL	23.4	91.9
	47.6	186.7

SUMMARY OF ANNUAL NONFUEL O&M COST FOR COAL-FIRED POWER PLANT WITH DRY FGD SYSTEM

VERSION 1/10/85
RUN DATE 1/14/85

SAMPLE PROBLEM		
NET RATING OF EACH UNIT (MWe)	550	
NUMBER OF UNITS PER PLANT	2	
BASE LOAD CAPACITY FACTOR	.65	
ESCALATION RATE (percent/year)	6.00	
SULFUR (percent)	0.5	
ASH (percent)	7.3	
HEATING VALUE (BTU/lb)	8200	
THERMAL INPUT PER UNIT (MWt)	1576	
PLANT NET HEAT RATE (BTU/kWh)	9780	
PLANT NET EFFICIENCY (percent)	34.9	
ANNUAL NET GENERATION (million kWh)	6268	
YEAR OF ESTIMATE	1983	
DIRECT COSTS ($million/year)		
STAFF ONSITE	9.20	
(269 PERSONS AT $34215)		
MAINTENANCE MATERIAL	3.38	
FIXED		2.67
VARIABLE		0.71
SUPPLIES AND EXPENSES	8.16	
FIXED		4.66
VARIABLE - PLANT		0.80
- LIME		0.97
- ASH, FGD SLUDGE		1.72
OFFSITE SUPPORT SERVICES	1.18	
INDIRECT COSTS ($million/year)		
ADMINISTRATIVE AND GENERAL	2.40	
PROPERTY INSURANCE		0.21
OTHER A&G		2.19
COSTS ($million/year)		
TOTAL FIXED DIRECTS AND INDIRECTS		20.1
TOTAL VARIABLE DIRECTS AND INDIRECTS		4.2
TOTAL NONFUEL O&M		24.3
UNIT COSTS (mills/kWh)		
FIXED DIRECTS AND INDIRECTS		3.21
VARIABLE DIRECTS AND INDIRECTS		0.67
TOTAL NONFUEL O&M		3.88

Appendix C

PROGRAM LISTINGS

```
10 REM  PWRCAP.BAS
20 REM CAPITAL INVESTMENT COST FOR LIGHT-WATER-REACTOR PLANTS
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 DIM N6(4)
70 DIM V1(15)
80 DIM T3$(11)
90 DIM E1(7)
100 DIM L1(7)
110 DIM M1(7)
120 DIM S2(7)
130 DIM I3(4)
140 DIM S3(4)
150 DIM T1$(11)
160 DIM M1$(31)
170 DIM M3(12)
180 DIM D4(4)
190 DIM C4(7)
200 DIM C7(4)
210 DIM U$(50)
220 PRINT TAB(20) "NUCLEAR POWERPLANT CAPITAL COSTS"
230 PRINT
240 REM  GET TODAYS DATE
250 FOR I=1 TO 4
260 PRINT
270 NEXT I
280 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
290 INPUT T4$
300 PRINT
310 PRINT
320 REM  SET DEFAULT VALUES
330 V$="      "
340 V2$="            "
350 V3$="                  "
360 P=3.14159
370 B1=1100
380 Y4=1983
390 R2=2738/2722
400 R1=0
410 Y1=1987
420 V1(1)=Y1
430 Y2=1989
440 V1(2)=Y2
450 Y3=1995
460 V1(3)=Y3
470 I1=9
480 V1(5)=I1
490 E2=7
500 V1(6)=E2
510 C1=10
520 V1(7)=C1
530 C2=5
540 V1(9)=C2
550 S1=1100
```

```
560 V1(8)=S1
570 V1(11)=Y4
580 DEF FNA(X,Y)=EXP(Y*LOG(X))
590 REM  CITY MULTIPLIERS
600 M3(1)=1
610 M3(2)=.9/R2
620 M3(3)=.95/R2
630 M3(4)=1!/R2
640 M3(5)=1!/R2
650 M3(6)=.94/R2
660 M3(7)=.96/R2
670 M3(8)=.96/R2
680 M3(9)=1.04/R2
690 M3(10)=1.07/R2
700 M3(11)=1.03/R2
710 REM READ DATA
720 FOR I=1 TO 11
730 READ T3$(I)
740 NEXT I
750 FOR I=1 TO 7
760 READ E1(I)
770 R1=R1+E1(I)
780 NEXT I
790 FOR I=1 TO 7
800 READ L1(I)
810 R1=R1+L1(I)
820 NEXT I
830 FOR I=1 TO 7
840 READ M1(I)
850 R1=R1+M1(I)
860 NEXT I
870 FOR I=1 TO 7
880 READ S2(I)
890 NEXT I
900 FOR I=1 TO 4
910 READ I3(I)
920 R1=R1+I3(I)
930 NEXT I
940 V1(10)=R1
950 FOR I=1 TO 4
960 READ S3(I)
970 NEXT I
980 T1$(1)="          20 LAND                          ####."
990 T1$(2)="          21 STRUCTURES                    ####."
1000 T1$(3)="          22 REACTOR PLANT                 ####."
1010 T1$(4)="          23 TURBINE PLANT                 ####."
1020 T1$(5)="          24 ELECTRIC PLANT                ####."
1030 T1$(6)="          25 MISC PLANT                    ####."
1040 T1$(7)="          26 MAIN COND HEAT REJ            ####."
1050 T1$(8)="          91 CONSTR SERVICES               ####."
1060 T1$(9)="          92 HOME OFFICE ENGRG             ####."
1070 T1$(10)="          93 FIELD OFFICE                  ####."
1080 T1$(11)="          94 OWNER COSTS                   ####."
1090 U$(1)="     YEAR OF STEAM SUPPLY SYSTEM PURCHASE          ####."
```

```
1100 U$(2)="      YEAR OF CONSTRUCTION PERMIT                    ####."
1110 U$(3)="      YEAR OF COMMERCIAL OPERATION                   ####."
1120 U$(4)="      INTEREST RATE DURING CONSTRUCTION (pct/yr)       ##."
1130 U$(5)="      ESCALATION RATE (percent/year)                   ##."
1140 U$(6)="      CONTINGENCY (percent)                            ##."
1150 U$(7)="      NET RATING PER UNIT (MWe)                      ####."
1160 U$(8)="      SUBTOTAL DIRECTS                                   ####."
1170 U$(9)="      SUBTOTAL INDIRECTS                                 ####."
1180 U$(10)="      SUBTOTAL DIRECTS AND INDIRECTS
####."
1190 U$(11)="      CONTINGENCY ALLOWANCE
####."
1200 U$(12)="      TOTAL DIRECT AND INDIRECT COSTS BEFORE ESC.
####."
1210 U$(13)="      ESCALATION DURING CONSTRUCTION
####."
1220 U$(14)="      TOTAL ESCALATED DIRECT AND INDIRECT COSTS
####."
1230 U$(15)="      TOTAL INTEREST DURING CONSTRUCTION
####."
1240 U$(16)="      TOTAL CAPITAL INVESTMENT MIDDLETOWN
####."
1250 U$(17)="      # UNIT PLANT CAPITAL INVESTMENT   (####. $/kWe)
#####."
1260 U$(18)="      PLANT LOCATION ADJUSTMENT &          ####."
1270 U$(19)="      PLANT LOCATION                      & "
1280 FOR I=1 TO 4
1290 READ M7(I)
1300 NEXT I
1310 REM  DATA
1320 REM T3$
1330 DATA "MIDDLETOWN   ","ATLANTA      ","BALTIMORE    ","BOSTON
"
1340 DATA "CHICAGO      "
1350 DATA "DALLAS       "
1360 DATA "DENVER       "
1370 DATA "KANSAS CITY  ","NEW YORK     ","SAN FRANCISCO","SEATTLE
"
1380 REM  E1
1390 DATA 5.0, 10.044,192.349,152.956,28.528,15.79,20.798
1400 REM L1
1410 DATA 0,109.531,44.752,40.024,29.041,19.712,15.411
1420 REM  M1
1430 DATA 0,62.988,13.902,8.104,13.327,5.093,2.751
1440 REM  S2
1450 DATA 0,.5,.6,.8,.4,.3,.8
1460 REM  I3
1470 DATA 162,175, 97,61.40
1480 REM  S3
1490 DATA 0.45,0.2,0.4,0.5
1500 REM TL$
1510 DATA 1.0,1.719512,2.449502,3.1794915
1520 REM  START OF MAIN PROGRAM
1530 REM
```

```
1540 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1550 PRINT
1560 REM
1570 REM  MENU ITEM STRINGS
1580 M1$(0)="RUN CASE, DATA ENTRY COMPLETE"
1590 M1$(1)="YEAR OF NSSS PURCHASE"
1600 M1$(2)="YEAR OF CONSTRUCTION PERMIT"
1610 M1$(3)="YEAR OF COMMERCIAL OPERATION"
1620 M1$(4)="YEAR OF CONSTANT $ OUTPUT"
1630 M1$(5)="INTEREST RATE"
1640 M1$(6)="ESCALATION RATE"
1650 M1$(7)="CONTINGENCY PERCENTAGE"
1660 M1$(8)="PLANT SIZE (MWE)"
1670 M1$(9)="CITY NUMBER"
1680 M1$(13)=" EXIT PROGRAM"
1690 FOR I=0 TO 9
1700 IF I=4 THEN 1720
1710 PRINT TAB(10) I;"  ";M1$(I);TAB(45) V1(I)
1720 NEXT I
1730 PRINT TAB(10)" 12  RESET TO DEFAULT VALUES"
1740 PRINT TAB(10)" 99 ";M1$(13)
1750 PRINT
1760 PRINT "     ITEM NUMBER:"
1770 INPUT M4
1780 IF M4=0 THEN 2200
1790 IF M4<=0 THEN 1560
1800 IF M4>= 10 THEN 1820
1810 GOTO 1870
1820 IF M4=12 THEN 1840
1830 GOTO 1860
1840 RESTORE
1850 GOTO 300
1860 IF M4>12 THEN 3260
1870 REM  INPUT NEW VARIABLES
1880 IF M4 <> 9 THEN 2020
1890 PRINT
1900 PRINT TAB(10)"** CITY NUMBERS **"
1910 PRINT
1920 FOR I=1 TO 11
1930 PRINT TAB(10) I;TAB(16) T3$(I)
1940 NEXT I
1950 PRINT
1960 PRINT
1970 PRINT "  ENTER # OF NEW CITY:  "
1980 INPUT V1(9)
1990 IF V1(9) < 1 THEN 1890
2000 IF V1(9) > 11 THEN 1890
2010 GOTO 2090
2020 REM
2030 IF M4=4 THEN 2060
2040 PRINT "     ";M1$(M4)
2050 INPUT V1(M4)
2060 REM
```

```
2070 IF V1(M4)<>0 THEN 2080
2080 REM
2090 Y1=V1(1)
2100 Y2=V1(2)
2110 Y3=V1(3)
2120 I1=V1(5)
2130 E2=V1(6)
2140 C1=V1(7)
2150 S1=V1(8)
2160 C2=V1(9)
2170 Y4=V1(11)
2180 R1=V1(10)
2190 GOTO 1530
2200 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
2210 INPUT R3$
2220 REM PRINT INPUT VALUES
2230 PRINT #1,V3$;" C A P I T A L   C O S T   E S T I M A T E"
2240 PRINT #1," "
2250 PRINT #1,V3$;"              VERSION 1/8/85"
2260 PRINT #1,V3$;"             RUN DATE ";T4$
2270 PRINT #1,V$
2280 PRINT #1,V$;R3$
2290 PRINT #1,V$;"EEDB PHASE VI, 1/83 REGULATORY STATUS"
2300 PRINT #1,V$;"PWR POWER PLANT"
2310 PRINT #1, USING U$(1); Y1
2320 PRINT #1, USING U$(2); Y2
2330 PRINT #1, USING U$(3); Y3
2340 PRINT #1, USING U$(4); I1
2350 PRINT #1, USING U$(5); E2
2360 PRINT #1, USING U$(6); C1
2370 PRINT #1, USING U$(7); S1
2380 PRINT #1, USING U$(19); T3$(C2)
2390 PRINT #1," "
2400 REM  SCALE DIRECTS
2410 S5=0
2420 S6=0
2430 E4=FNA((1+E2/100),(Y1-Y4))
2440 FOR A1=1 TO 7
2450 C4(A1)=(E1(A1)+L1(A1)+M1(A1))*FNA((S1/B1),S2(A1))*E4
2460 S5=S5+C4(A1)
2470 NEXT A1
2480 FOR A1=1 TO 4
2490 C7(A1)=I3(A1)*FNA((S1/B1),S3(A1))*E4
2500 S6=S6+C7(A1)
2510 NEXT A1
2520 S7=S5+S6
2530 PRINT #1,V$;"DIRECT COSTS ($MILLIONS)"
2540 E1=0
2550 L1=0
2560 M1=0
2570 FOR I = 1 TO 7
2580 PRINT #1, USING T1$(I);C4(I)
2590 NEXT I
2600 PRINT #1, USING U$(8); S5
```

```
2610 PRINT #1," "
2620 REM SCALE INDIRECTS
2630 PRINT #1,V$;" INDIRECT COSTS"
2640 FOR I = 1 TO 4
2650 PRINT #1, USING T1$(7+I); C7(I)
2660 NEXT I
2670 PRINT #1, USING U$(9); S6
2680 PRINT #1," "
2690 PRINT #1, USING U$(10); S7
2700 REM  CONTINGENCY CALCS.
2710 C5=C1*S7/100
2720 PRINT #1, USING U$(11); C5
2730 S9=S7+C5
2740 X2=(.095/.333)*(Y2-Y1)/(Y3-Y1)
2750 E6=P/(1-X2)
2760 B3=P/2-E6
2770 N5=Y3-Y1
2780 C9=0
2790 E8=0
2800 E9=0
2810 E=(1+E2/200)/(1+E2/100)
2820 W1=0
2830 FOR C0=1 TO N5
2840 R3=C0
2850 X=R3/N5
2860 IF X >= X2 THEN 2880
2870 X=X2
2880 R=E6*X+B3
2890 Y=.5*SIN(R)+.5
2900 W=S9*Y
2910 E=(1+E2/100)*E
2920 E7=(W-W1)*(E-1)
2930 E9=E8+W1
2940 W1=W
2950 E8=E8+E7
2960 E0=W+E8
2970 A2=(E9+E0)/2+C9
2980 F2=A2*I1/100
2990 C9=C9+F2
3000 W2=E0+C9
3010 L=W2*(M3(C2)-1)
3020 N8=W2+L
3030 FOR U=1 TO 4
3040 N6(U)=N8*M7(U)
3050 D4(U)=N6(U)*1000/(S1*U)
3060 NEXT U
3070 NEXT C0
3080 PRINT #1, USING U$(12); S9
3090 PRINT #1," "
3100 PRINT #1, USING U$(13); E8
3110 PRINT #1, USING U$(14); E0
3120 PRINT #1," "
3130 PRINT #1, USING U$(15); C9
3140 PRINT #1," "
```

```
3150 PRINT #1, USING U$(16); W2
3160 PRINT #1," "
3170 PRINT #1, USING U$(18);T3$(C2); L
3180 PRINT #1," "
3190 PRINT #1," "
3200 FOR I=1 TO 4
3210 PRINT #1, USING U$(17);I; D4(I);N6(I)
3220 NEXT I
3230 PRINT #1, CHR$(12)
3240 GOTO 1530
3250 CLOSE #1
3260 END
```

```
10 REM  PWROM.BAS
20 REM  NONFUEL O&M COST FOR LWR PLANTS
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 REM  A      ANNGEN
70 REM  A$     ANSWER
80 REM  A1     ADM
90 REM  A2     ADMGEN
100 REM  B1     BASECF
110 REM  B2     BASEYR
120 REM  B3     BASM
130 REM  C1     COMINS
140 REM  C2     COSTAF
150 REM  C3     COVER
160 REM  D      DIRECT
170 REM  D$
180 REM  E      ETANET
190 REM  E0     ESCGEN
200 REM  E1     ESCINS
210 REM  E2     ESCPIN
220 REM  E3     ESCPOW
230 REM  E4     ESCSUP
240 REM  E5     ESFEES
250 REM  E6     ESGINS
260 REM  E7     ESMATL
270 REM  E8     ESWAGE
280 REM  E9     EXCESS
290 REM  F1     FEEINS
300 REM  F2     FIXFAC
310 REM  F3     FIXMIL
320 REM  F4     FIXMNT
330 REM  F5     FIXSE
340 REM  F6     FORTYR
350 REM  F7     FRINGE
360 REM  F8     FULLYR
370 REM  G      GOVINS
380 REM  H      HUNDRED
390 REM  H1     HTRATE
400 REM  I1     IESC
410 REM  M      MILLION
420 REM  M1     MWT
430 REM  M2     MWN
440 REM  M3     MANCOS
450 REM  N      NUM
460 REM  O      OVERTHOU
470 REM  P      PLTFAC
480 REM  P1     PENPCT
490 REM  P2     PRIMAR
500 REM  P3     PRIMUL
510 REM  P4     PROPIN
520 REM  P5     PROPRT
530 REM  R1     RETRO
540 REM  R2     RPOWER
550 REM  R3$
```

```
560 REM  S      STAFF
570 DIM  S(4)
580 REM  S1     SUPER
590 REM  S2     SUPEXP
600 REM  S3     STAFF3
610 DIM  S3(4)
620 REM  S4     STAFF4
630 DIM  S4(4)
640 REM  S5     SUPEXF
650 REM  S6     SUPORT
660 REM  T      THOUSAND
670 REM  T1     TOTAL
680 REM  T2     TOTFIX
690 REM  T3     TOTMIL
700 REM  T4     TOTMNT
710 REM  T5     TOTVAR
720 REM  U      UNITS
730 REM  U$
740 DIM  U$(50)
750 REM  V
760 REM  V$     V
770 REM  V1     VARFAC
780 REM  V2     VARMIL
790 REM  V3     VARMNT
800 REM  V4     VSEBAS
810 REM  V5     VSEMIL
820 REM  W      WAGERT
830 REM  X      EXCMUL
840 REM  Y      YEAR
850 REM  Z$
860 DEF FNI(B2,Y,E8)=(1+E8/100) (Y-B2)
870 PRINT TAB(20) "NONFUEL O&M COST FOR LWR PLANTS" : PRINT
880 REM  GET TODAY'S DATE
890 FOR I=1 TO 4
900 PRINT
910 NEXT I
920 PRINT "      ENTER TODAY'S DATE : MO/DA/YR"
930 INPUT D$
940 U$(1)="      NET RATING OF EACH UNIT (MWe)                    ####."
950 U$(2)="      NUMBER OF UNITS PER PLANT                           #."
960 U$(3)="      BASE LOAD CAPACITY FACTOR                         .##"
970 U$(4)="      ESCALATION RATE (percent/year)                  ##.##"
980 U$(5)="      THERMAL INPUT PER UNIT (MWt)                     ####."
990 U$(6)="      PLANT NET HEAT RATE (BTU/kWh)                   #####."
1000 U$(7)="      PLANT NET EFFICIENCY (percent)                   ##.#"
1010 U$(8)="      ANNUAL NET GENERATION (million kWh)             #####."
1020 U$(9)="      YEAR OF ESTIMATE                                 ####."
1030 U$(10)="      STAFF ONSITE                                    ##.##"
1040 U$(11)="      (###. PERSONS AT $$####.)"
1050 U$(12)="      MAINTENANCE MATERIAL                            ##.##"
1060 U$(13)="           FIXED
##.##"
1070 U$(14)="           VARIABLE
##.##"
```

```
1080 U$(15)="      SUPPLIES AND EXPENSES                          ##.##"
1090 U$(16)="      FEES, INSPECTIONS, REVIEWS                     ##.##"
1100 U$(17)="      OFFSITE SUPPORT SERVICES                       ##.##"
1110 U$(18)="      ADMINISTRATIVE AND GENERAL                     ##.##"
1120 U$(19)="           COMMERCIAL LIABILITY INSURANCE
##.##"
1130 U$(20)="           RETROSPECTIVE PREMIUM
##.##"
1140 U$(21)="           GOVERNMENT LIABILITY INSURANCE
##.##"
1150 U$(22)="           PROPERTY INSURANCE (PRIMARY)
##.##"
1160 U$(23)="           PROPERTY INSURANCE (EXCESS)
##.##"
1170 U$(24)="           REPLACEMENT POWER INSURANCE
##.##"
1180 U$(25)="           OTHER A&G
##.##"
1190 U$(26)="      TOTAL FIXED DIRECTS AND INDIRECTS
###.#"
1200 U$(27)="      TOTAL VARIABLE DIRECTS AND INDIRECTS
###.#"
1210 U$(28)="      TOTAL NONFUEL O&M
###.#"
1220 U$(29)="      FIXED DIRECTS AND INDIRECTS
##.##"
1230 U$(30)="      VARIABLE DIRECTS AND INDIRECTS
##.##"
1240 U$(31)="      TOTAL NONFUEL O&M
##.##"
1250 REM  CONSTANTS
1260 V$="      "
1270 F6=2080
1280 W=10.45
1290 B1=.8
1300 B2=1982
1310 C3=500000!
1320 F2=.75
1330 F6=2080
1340 F7=35
1350 F8=8766
1360 H=100!
1370 M=1000000!
1380 O=.001
1390 P1=5
1400 P5=.4
1410 S1=20
1420 S5=4800
1430 T=1000!
1440 V1=.25
1450 V5=.1
1460 W=10.45
1470 Z$="&"
1480 REM  INIT01
```

```
1490 FOR I=1 TO 4
1500 READ S(I)
1510 DATA 401,543,715,865
1520 NEXT I
1530 FOR I=1 TO 4
1540 READ S3(I)
1550 DATA 122,195,278,351
1560 NEXT I
1570 FOR I=1 TO 4
1580 READ S4(I)
1590 DATA 50,59,74,83
1600 NEXT I
1610 I1=1
1620 M2=1100
1630 U=1
1640 P=.65
1650 H1=10200
1660 Y=1983
1670 REM  INIT02
1680 E8=8
1690 E7=10
1700 E4=10
1710 E5=8
1720 E1=6
1730 E6=0
1740 E2=6
1750 E3=9
1760 E0=6
1770 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1780 PRINT
1790 PRINT "     0 = RUN CASE, DATA ENTRY COMPLETE"
1800 PRINT "     1 = NET RATING OF EACH UNIT (MWe) ";M2
1810 PRINT "     2 = NUMBER OF UNITS PER PLANT ";U
1820 PRINT "     3 = BASE LOAD CAPACITY FACTOR ";P
1830 PRINT "     4 = YEAR OF OPERATION ";Y
1840 IF I1=1 GOTO 1860
1850 IF I1=2 GOTO 1880
1860 PRINT "     5 = ESCALATION RATES -- VARIOUS"
1870 GOTO 1890
1880 PRINT "     5 = ESCALATION RATE (percent) ";E0
1890 PRINT "     6 = PLANT NET HEAT RATE ";H1
1900 PRINT "    99 = EXIT PROGRAM"
1910 PRINT
1920 PRINT "     ENTER A NUMBER FROM THE MENU"
1930 INPUT N
1940 IF N=0 GOTO 2360
1950 IF N=1 GOTO 2020
1960 IF N=2 GOTO 2050
1970 IF N=3 GOTO 2080
1980 IF N=4 GOTO 2110
1990 IF N=5 GOTO 2140
2000 IF N=6 GOTO 2320
2010 IF N > 6 GOTO 3470
```

```
2020 PRINT "     INPUT MWE NET RATING PER UNIT"
2030 INPUT M2
2040 GOTO 1770
2050 PRINT "     INPUT NUMBER OF UNITS PER PLANT"
2060 INPUT U
2070 GOTO 1770
2080 PRINT "     INPUT BASE LOAD CAPACITY FACTOR AS A DECIMAL"
2090 INPUT P
2100 GOTO 1770
2110 PRINT "     INPUT YEAR OF OPERATION"
2120 INPUT Y
2130 GOTO 1770
2140 PRINT "     DO YOU WANT TO USE THE DEFAULT GENERAL ESCALATION
RATE?"
2150 PRINT "     (Y OR N)"
2160 INPUT A$
2170 IF A$="Y" GOTO 2200
2180 IF A$="y" GOTO 2200
2190 GOTO 2220
2200 GOSUB 3340
2210 GOTO 2310
2220 PRINT "     DO YOU WANT TO INPUT A GENERAL ESCALATION RATE? (Y OR
N)"
2230 INPUT A$
2240 IF A$="Y" GOTO 2280
2250 IF A$="y" GOTO 2280
2260 I1=1
2270 GOTO 2310
2280 PRINT "     INPUT ESCALATION RATE (PERCENT)"
2290 INPUT E0
2300 GOSUB 3340
2310 GOTO 1770
2320 PRINT "     INPUT PLANT NET HEAT RATE(BTU/kWh)"
2330 INPUT H1
2340 GOTO 1770
2350 REM  WRITEIT1
2360 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
2370 INPUT R3$
2380 PRINT #1,"          SUMMARY OF ANNUAL NONFUEL O&M COST FOR PWR
POWER PLANT
2390 PRINT #1,V$
2400 PRINT #1,"                              VERSION 1/10/85"
2410 PRINT #1,"                             RUN DATE ";D$
2420 PRINT #1,V$
2430 PRINT #1,V$;R3$
2440 PRINT #1, USING U$(1); M2
2450 PRINT #1, USING U$(2); U
2460 PRINT #1, USING U$(3); P
2470 IF I1=1 GOTO 2490
2480 IF I1=2 GOTO 2510
2490 PRINT #1,"     INDIVIDUAL ESCALATION RATES USED "
2500 GOTO 2530
2510 PRINT #1, USING U$(4); E0
2520 REM  PRELIM2
```

```
2530 E=3412.14*H/H1
2540 M1=M2*H/E
2550 A=M2*F8*P*U/T
2560 PRINT #1, USING U$(5); M1
2570 PRINT #1, USING U$(6); H1
2580 PRINT #1, USING U$(7); E
2590 PRINT #1, USING U$(8); A
2600 PRINT #1, USING U$(9); Y
2610 REM  STAFFING
2620 M3=F6*W*(1+F7/H)*(1+S1/H)*(1+P1/H)*FNI(B2,Y,E8)
2630 C2=S(U)*M3/M
2640 PRINT #1,V$
2650 PRINT #1,"              DIRECT COSTS ($million/year) "
2660 PRINT #1, USING U$(10);C2
2670 PRINT #1, USING U$(11); S(U);M3
2680 REM  MAINT
2690 B3=S3(U)*(M3/M)*((H+E7)/(H+E8))  (Y-B2)
2700 F4=F2*B3
2710 V3=V1*B3*P/B1
2720 T4=F4+V3
2730 PRINT #1,V$
2740 PRINT #1, USING U$(12);T4
2750 PRINT #1, USING U$(13);F4
2760 PRINT #1, USING U$(14);V3
2770 REM  SUPPLIES
2780 V4=V5*(A/T)*FNI(B2,Y,E4)
2790 F5=(S5/T)*U*FNI(B2,Y,E4)
2800 S2=F5+V4
2810 PRINT #1,V$
2820 PRINT #1, USING U$(15);S2
2830 PRINT #1, USING U$(13);F5
2840 PRINT #1, USING U$(14);V4
2850 REM FEES
2860 F1=O*(219+269*U)*FNI(B2,Y,E5)
2870 PRINT #1,V$
2880 PRINT #1, USING U$(16);F1
2890 REM  OFFSITE
2900 S6=S4(U)*M3*2/M
2910 PRINT #1,V$
2920 PRINT #1, USING U$(17);S6
2930 REM  ADMINGEN
2940 C1=O*(239.68+161.21*U)*FNI(B2,Y,E1)
2950 R1=O*10*U*FNI(B2,Y,E1)
2960 P3=.18+.82*U
2970 X=.86+.14*U
2980 P2=O*(P3*P5*C3/H)*FNI(B2,Y,E2)
2990 E9=O*(X*.8*P5*C3/H)*FNI(B2,Y,E2)
3000 P4=P2+E9
3010 R2=2*U*FNI(B2,Y,E3)
3020 D=C2+T4+S2+F1+S6
3030 A1=15*D/H
3040 A2=C1+R1+P2+E9+R2+A1
3050 REM  ADMINOUT
3060 PRINT #1,V$
```

```
3070 PRINT #1,"            INDIRECT COSTS ($million/year)"
3080 PRINT #1, USING U$(18);A2
3090 PRINT #1, USING U$(19);C1
3100 PRINT #1, USING U$(20);R1
3110 PRINT #1, USING U$(22);P2
3120 PRINT #1, USING U$(23);E9
3130 PRINT #1, USING U$(24);R2
3140 PRINT #1, USING U$(25);Z$;A1
3150 REM  FINAL
3160 T2=C2+F4+F1+A2+F5+S6
3170 T5=V3+V4
3180 T1=T2+T5
3190 F3=T*T2/A
3200 V2=T*T5/A
3210 T3=T*T1/A
3220 PRINT #1,V$
3230 PRINT #1,"            COSTS ($million/year)"
3240 PRINT #1, USING U$(26);T2
3250 PRINT #1, USING U$(27);T5
3260 PRINT #1, USING U$(28);Z$;T1
3270 PRINT #1,V$
3280 PRINT #1,"            UNIT COSTS (mills/kWh)"
3290 PRINT #1, USING U$(29);F3
3300 PRINT #1, USING U$(30);V2
3310 PRINT #1, USING U$(31);Z$;T3
3320 PRINT #1, CHR$(12)
3330 GOTO 3450
3340 REM  REDOESC
3350 I1=2
3360 E8=E0
3370 E7=E0
3380 E4=E0
3390 E5=E0
3400 E1=E0
3410 E6=E0
3420 E2=E0
3430 E3=E0
3440 RETURN
3450 PRINT
3460 GOTO 1770
3470 CLOSE #1
3480 END
```

```
10 REM  NFUEL.BAS
20 REM  NUCLEAR FUEL CYCLE COST FOR LIGHT-WATER-REACTOR PLANT
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 DEF FNV(A2)=(2*A2-1)*LOG(A2/(1-A2))
70 DEF FNA(A,B)=A-INT(A/B)*B
80 PRINT TAB(5) "NUCLEAR FUEL CYCLE COST FOR LWR PLANT"
90 PRINT
100 REM  GET TODAY'S DATE
110 FOR K=1 TO 4
120 PRINT
130 NEXT K
140 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
150 INPUT D$
160 REM
170 REM  A    AA
180 DIM  A(7,50)
190 REM  A$   ANSWER
200 REM  B    BLEAD
210 REM  B$
220 DIM  B$(11)
230 REM  C$
240 REM  C    COLUMN IN ALEAD(R,C)
250 REM  C1   CLEV
260 DIM  C1(11)
270 REM  C2   CONL
280 DIM  C2(11)
290 REM  C3   CUML
300 DIM  C3(11)
310 REM  C4   CVLS
320 REM  C5   CVU
330 REM  C6   CAPF
340 REM  C7   CRFC
350 REM  C8   CRFN
360 REM  C9   CUMS
370 REM  D$
380 REM  D    DT
390 DIM  D(50)
400 REM  D1   DISC
410 REM  E$
420 REM  E    ESC
430 DIM  E(7)
440 REM  E1   EF
450 REM  E2   EP
460 REM  E3   ESLG
470 REM  E4   EFFCOM
480 REM  F   FACT1
490 DIM  F(11)
500 REM  F1   FLOSS
510 DIM  F1(10)
520 REM  F2   FBLS
530 REM  F3   FMAS
540 REM  I   ICAP
550 DIM  I(11)
```

```
560 REM  I1    IM
570 REM  J     INDEX
580 REM  J0    INDEX
590 REM  K     KK
600 REM  L    ALEAD
610 DIM  L(11,2)
620 REM  L1    CYCLEN
630 REM  M     M
640 REM  N     NUM
650 REM  N1    NB
660 REM  N2    NBT
670 REM  N3    NCY
680 REM  N4    NCRD
690 REM  N5    NLIFE
700 REM  N6    NBCORE
710 REM  P     PSB
720 DIM  P(50)
730 REM  P0    POWER
740 REM  P1    PCREF
750 DIM  P1(7)
760 REM  P2    PUFLS
770 REM  P3    PUPLS
780 REM  P4    PRC
790 REM  P5    PWRA
800 REM  P6    PWRR
810 REM  Q    QUAN
820 DIM  Q(10)
830 REM  R     ROW IN ALEAD(R,C)
840 REM  R0    RATIO
850 REM  R1    RDT
860 REM  R2    RDIS
870 REM  R3    RINFLA
880 REM  R4    CAPREF
890 REM  S     SWU
900 REM  S1    SLAG
910 REM  S2    TSTRT
920 REM  T$    TITLE
930 DIM  T$(11)
940 REM  T0    TOT
950 REM  T1    TIN
960 DIM  T1(50)
970 REM  T2    TOUT
980 DIM  T2(50)
990 REM  T3    TF
1000 REM  T4    TXR
1010 REM  T5    TAIL
1020 REM  T6    TMAS
1030 REM  T7    TOTC
1040 REM  T8    TREF
1050 REM  T9    TLIFE
1060 REM  U$
1070 DIM  U$(50)
1080 REM  U     URPLS
1090 REM  U0    UORE
```

```
1100 REM  V     VAL
1110 REM  V$    V
1120 REM  X     XC
1130 REM  X1    XCY
1140 REM  X2    XDT
1150 REM  X3    XLD
1160 REM  X4    XBCR
1170 REM  X5    TXTRM
1180 REM  CONSTANTS
1190 C$="$"
1200 U$(1)="      YEAR OF STARTUP
####."
1210 U$(2)="      CAPACITY FACTOR
#.##"
1220 U$(3)="      LAG TIME (years)
##.#"
1230 U$(4)="      BASE YEAR FOR COST DATA
####."
1240 U$(5)="      INFLATION RATE
#.##"
1250 U$(6)="      EFFECTIVE COST OF MONEY
.####"
1260 U$(7)="      INCOME TAX RATE
.####"
1270 U$(8)="           U3O8 (&/lb)
###.##"
1280 U$(9)="           CONVERSION (&/kg)
###.##"
1290 U$(10)="           ENRICHMENT (&/SWU)
###.##"
1300 U$(11)="           PLUTONIUM (&/gm)
###.##"
1310 U$(12)="           FABRICATION (&/gm)
###.##"
1320 U$(13)="           BACK END (reprocessing) (&/kg)
###.##"
1330 U$(14)="           WASTE DISPOSAL (mills/kWh)
###.##"
1340 U$(15)="           U3O8
.###"
1350 U$(16)="           CONVERSION
.###"
1360 U$(17)="           ENRICHMENT
.###"
1370 U$(18)="           PLUTONIUM
.###"
1380 U$(19)="           FABRICATION
.###"
1390 U$(20)="           BACK END (reprocessing)
.###"
1400 U$(21)="           WASTE DISPOSAL
.###"
1410 U$(22)="      &                    ##.###              ##.###"
1420 U$(23)="
```

```
##.###                ##.###"
1430 V$="      "
1440 C4=.005
1450 F2=.01
1460 P2=.01
1470 U=.01
1480 P3=.01
1490 E1=.00711
1500 B$(1)="URANIUM PURCHASE   "
1510 B$(2)="CONVERSION PURCHASE"
1520 B$(3)="ENRICHMENT PURCHASE"
1530 B$(4)="PLUTONIUM PURCHASE "
1540 B$(5)="FABRICATION        "
1550 B$(6)="URANIUM CREDIT     "
1560 B$(7)="CONVERSION CREDIT  "
1570 B$(8)="ENRICHMENT CREDIT  "
1580 B$(9)="PLUTONIUM SALES    "
1590 B$(10)="REPROCESSING       "
1600 B$(11)="WASTE DISPOSAL     "
1610 REM  INIT00
1620 S2=1995
1630 C6=.65
1640 S1=.5
1650 A$="N"
1660 R3=.06
1670 E4=9.000001E-02
1680 T4=.4816
1690 T8=1983
1700 FOR J=1 TO 7
1710 READ P1(J)
1720 DATA 34.0,8,139,0,200,0,1
1730 NEXT J
1740 FOR J=1 TO 7
1750 READ E(J)
1760 DATA .079,.06,.043,.06,.06,.06,.06
1770 NEXT J
1780 REM  INIT01
1790 N6=3
1800 T9=30
1810 R4=.75
1820 C9=0
1830 N4=0
1840 T5=.002
1850 P0=1270
1860 REM  INIT02
1870 FOR C=1 TO 2
1880 FOR R=1 TO 11
1890 READ L(R,C)
1900 DATA 1.75,1.42,1.25,1,.5,-1,-1,-1,-1,-5,0
1910 DATA 1,.67,.5,1,.25,-1,-1,-1,-1,-5,0
1920 NEXT R
1930 NEXT C
1940 REM  INIT03 & INIT04
1950 FOR J0=1 TO 11
```

```
1960 FOR J=1 TO 2
1970 READ A(J,J0)
1980 NEXT J
1990 FOR J=4 TO 6
2000 READ A(J,J0)
2010 NEXT J
2020 NEXT J0
2030 DATA 34119,565,33567,243,157
2040 DATA 32235,711,31243,214,176
2050 DATA 32962,925,31657,244,206
2060 DATA 34119,1071,32708,304,227
2070 DATA 34545,1028,33101,271,228
2080 DATA 34119,984,32728,261,223
2090 DATA 34119,1058,32703,295,226
2100 DATA 34545,1026,33115,274,228
2110 DATA 34119,1028,32704,278,225
2120 DATA 34119,1028,32704,278,225
2130 DATA 34545,1041,33112,282,228
2140 REM  INITITLE
2150 T$(1)="URANIUM PURCHASE"
2160 T$(2)="CONVERSION PURCHASE"
2170 T$(3)="ENRICHMENT PURCHASE"
2180 T$(4)="PLUTONIUM PURCHASE"
2190 T$(5)="FABRICATION"
2200 T$(6)="URANIUM CREDIT"
2210 T$(7)="CONVERSION CREDIT"
2220 T$(8)="ENRICHMENT CREDIT"
2230 T$(9)="PLUTONIUM SALES"
2240 T$(10)="REPROCESSING"
2250 T$(11)="WASTE DISPOSAL"
2260 REM <<<<<=====START OF MENU READ
2270 REM  MEN1
2280 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
2290 PRINT
2300 PRINT "     0 = RUN CASE, DATA ENTRY COMPLETE"
2310 PRINT "     1 = YEAR OF STARTUP ";S2
2320 PRINT "     2 = CAPACITY FACTOR ";C6
2330 PRINT "     3 = LAG TIME FOR RECEIPTS ";S1
2340 PRINT "     4 = DISCHARGE FISSILE CREDIT ";A$
2350 PRINT "     5 = INFLATION RATE ";R3
2360 PRINT "     6 = EFFECTIVE COST OF MONEY ";E4
2370 PRINT "     7 = INCOME TAX RATE ";T4
2380 PRINT "     8 = BASE YEAR FOR COST DATA ";T8
2390 REM  MEN2
2400 PRINT "     9 = U3O8 PRICE AND ESCALATION ";P1(1);E(1)
2410 PRINT "    10 = CONVERSION PRICE AND ESCALATION "P1(2);E(2)
2420 PRINT "    11 = ENRICHMENT PRICE AND ESCALATION ";P1(3);E(3)
2430 PRINT "    12 = PLUTONIUM PRICE AND ESCALATION ";P1(4);E(4)
2440 PRINT "    13 = FABRICATION PRICE AND ESCALATION ";P1(5);E(5)
2450 PRINT "    14 = REPROCESSING PRICE AND ESCALATION ";P1(6);E(6)
2460 PRINT "    15 = WASTE DISPOSAL PRICE AND ESCALATION ";P1(7);E(7)
2470 PRINT "    99 = EXIT PROGRAM"
2480 REM  MEN3
```

```
2490 PRINT
2500 PRINT "     ENTER A NUMBER FROM THE MENU"
2510 INPUT N
2520 IF N=0 GOTO 3350
2530 IF N=1 GOTO 2690
2540 IF N=2 GOTO 2720
2550 IF N=3 GOTO 2750
2560 IF N=4 GOTO 2790
2570 IF N=5 GOTO 2880
2580 IF N=6 GOTO 2910
2590 IF N=7 GOTO 2940
2600 IF N=8 GOTO 2970
2610 IF N=9 GOTO 3000
2620 IF N=10 GOTO 3050
2630 IF N=11 GOTO 3100
2640 IF N=12 GOTO 3150
2650 IF N=13 GOTO 3200
2660 IF N=14 GOTO 3250
2670 IF N=15 GOTO 3300
2680 IF N > 15 GOTO 3530
2690 PRINT "     INPUT YEAR OF STARTUP "
2700 INPUT S2
2710 GOTO 2270
2720 PRINT "     INPUT CAPACITY FACTOR "
2730 INPUT C6
2740 GOTO 2270
2750 PRINT "     INPUT LAG TIME FOR RECEIPTS"
2760 PRINT "     YEARS (as a decimal)"
2770 INPUT S1
2780 GOTO 2270
2790 PRINT "     CREDIT FOR DISCHARGED FISSILE?"
2800 PRINT "     ANSWER Y OR N"
2810 INPUT A$
2820 IF A$="Y" GOTO 2860
2830 IF A$="y" GOTO 2860
2840 N4=0
2850 GOTO 2270
2860 N4=1
2870 GOTO 2270
2880 PRINT "     INPUT INFLATION RATE (decimal)"
2890 INPUT R3
2900 GOTO 2270
2910 PRINT "     INPUT EFFECTIVE COST OF MONEY (decimal)"
2920 INPUT E4
2930 GOTO 2270
2940 PRINT "     INPUT INCOME TAX RATE (decimal)"
2950 INPUT T4
2960 GOTO 2270
2970 PRINT "     INPUT BASE YEAR FOR COST DATA"
2980 INPUT T8
2990 GOTO 2270
3000 PRINT "     INPUT U3O8 PRICE ($/lb)"
3010 INPUT P1(1)
3020 PRINT "     INPUT U3O8 ESCALATION RATE (decimal)"
```

```
3030 INPUT E(1)
3040 GOTO 2270
3050 PRINT "      INPUT CONVERSION PRICE ($/kg)"
3060 INPUT P1(2)
3070 PRINT "      INPUT CONVERSION ESCALATION RATE (decimal)"
3080 INPUT E(2)
3090 GOTO 2270
3100 PRINT "      INPUT ENRICHMENT PRICE ($/SWU)"
3110 INPUT P1(3)
3120 PRINT "      INPUT ENRICHMENT ESCALATION RATE (decimal)"
3130 INPUT E(3)
3140 GOTO 2270
3150 PRINT "      INPUT PLUTONIUM PRICE ($/gm)"
3160 INPUT P1(4)
3170 PRINT "      INPUT PLUTONIUM ESCALATION RATE (decimal)"
3180 INPUT E(4)
3190 GOTO 2270
3200 PRINT "      INPUT FABRICATION PRICE ($/kg)"
3210 INPUT P1(5)
3220 PRINT "      INPUT FABRICATION ESCALATION RATE (decimal)"
3230 INPUT E(5)
3240 GOTO 2270
3250 PRINT "      INPUT REPROCESSING PRICE ($/kg)"
3260 INPUT P1(6)
3270 PRINT "      INPUT REPROCESSING ESCALATION RATE (decimal)"
3280 INPUT E(6)
3290 GOTO 2270
3300 PRINT "      INPUT WASTE DISPOSAL PRICE (mills/kWh)"
3310 INPUT P1(7)
3320 PRINT "      INPUT WASTE DISPOSAL ESCALATION RATE (decimal)"
3330 INPUT E(7)
3340 GOTO 2270
3350 REM <<<<<=====END OF MENU READ
3360 PRINT "      ENTER RUN IDENTIFICATION (OR NULL LINE)"
3370 INPUT E$
3380 GOSUB 3550 'WRITEIT0
3390 GOSUB 3690 'WRITEIT1
3400 GOSUB 3790 'WRITEIT2
3410 GOSUB 3850 'WRITEIT3
3420 GOSUB 3960 'WRITEIT4
3430 GOSUB 4070 'CALC01
3440 GOSUB 4330 'AAARAY
3450 GOSUB 4440 'BATCH
3460 GOSUB 4830 'CALCONST
3470 GOSUB 4960 'MAINLOOP
3480 GOSUB 5260 'HEADING
3490 GOSUB 5350 'LEVEL
3500 PRINT #1, CHR$(12)
3510 RESTORE
3520 GOTO 1610
3530 CLOSE #1
3540 END
3550 REM  WRITEIT0
3560 PRINT #1,V$;"N U C L E A R  F U E L  C Y C L E  C O S T"
```

```
3570 PRINT #1,V$
3580 PRINT #1,V$;"                    VERSION 1/10/85"
3590 PRINT #1,V$;"                   RUN DATE ";D$
3600 PRINT #1,V$
3610 PRINT #1,V$
3620 PRINT #1,V$;"INPUT DATA"
3630 PRINT #1,V$;"__________"
3640 PRINT #1,V$
3650 PRINT #1,V$;E$
3660 PRINT #1, USING U$(1); S2
3670 PRINT #1, USING U$(2); C6
3680 RETURN
3690 REM  WRITEIT1
3700 PRINT #1, USING U$(3); S1
3710 IF A$="Y" GOTO 3750
3720 IF A$="y" GOTO 3750
3730 IF A$="N" GOTO 3770
3740 IF A$="n" GOTO 3770
3750 PRINT #1,V$;"CREDIT FOR DISCHARGED FISSILE "
3760 GOTO 3780
3770 PRINT #1,V$;"NO CREDIT FOR DISCHARGED FISSILE "
3780 RETURN
3790 REM  WRITEIT2
3800 PRINT #1, USING U$(4); T8
3810 PRINT #1, USING U$(5); R3
3820 PRINT #1, USING U$(6); E4
3830 PRINT #1, USING U$(7); T4
3840 RETURN
3850 REM  WRITEIT3
3860 PRINT #1,V$
3870 PRINT #1,V$;"REFERENCE YEAR PRICES"
3880 PRINT #1,USING U$(8); C$; P1(1)
3890 PRINT #1, USING U$(9); C$; P1(2)
3900 PRINT #1, USING U$(10); C$; P1(3)
3910 PRINT #1, USING U$(11); C$; P1(4)
3920 PRINT #1, USING U$(12); C$; P1(5)
3930 PRINT #1, USING U$(13); C$; P1(6)
3940 PRINT #1, USING U$(14); P1(7)
3950 RETURN
3960 REM  WRITEIT4
3970 PRINT #1,V$
3980 PRINT #1,V$;"PRICE ESCALATION RATES "
3990 PRINT #1, USING U$(15); E(1)
4000 PRINT #1, USING U$(16); E(2)
4010 PRINT #1, USING U$(17); E(3)
4020 PRINT #1, USING U$(18); E(4)
4030 PRINT #1, USING U$(19); E(5)
4040 PRINT #1, USING U$(20); E(6)
4050 PRINT #1, USING U$(21); E(7)
4060 RETURN
4070 REM  CALC01
4080 L1=R4/C6
4090 N5=T9/L1
4100 N2=N6-1+N5
```

```
4110 P5=P0*C6*8.759999E-03
4120 D1=LOG(1+E4)
4130 E3=EXP(-S1*D1)
4140 FOR J=1 TO 9
4150 I(J)=0
4160 NEXT J
4170 I(10)=1
4180 I(11)=-1
4190 FOR M=1 TO 11
4200 C3(M)=0
4210 NEXT M
4220 F1(1)=1/((1-C4)*(1-F2))
4230 F1(2)=1/(1-F2)
4240 F1(3)=F1(2)
4250 F1(4)=1/(1-P2)
4260 F1(5)=1
4270 F1(6)=1-U
4280 F1(7)=F1(6)
4290 F1(8)=F1(6)
4300 F1(9)=1-P3
4310 F1(10)=1
4320 RETURN
4330 REM  AAARAY
4340 FOR N1=12 TO N2
4350 FOR I1=1 TO 7
4360 A(I1,N1)=A(I1,N1-N6)
4370 NEXT I1
4380 NEXT N1
4390 FOR N1=1 TO N2
4400 A(3,N1)=0
4410 A(7,N1)=A(1,N1)+A(3,N1)
4420 NEXT N1
4430 RETURN
4440 REM  BATCH
4450 N3=0
4460 N1=1
4470 WHILE N1 <= N2
4480 IF N1<=N6 GOTO 4500
4490 GOTO 4590
4500 N3=N3+1
4510 T1(N1)=0
4520 IF N1=1 GOTO 4540
4530 GOTO 4550
4540 T2(N1)=L1
4550 REM
4560 IF N1 > 1 GOTO 4580
4570 GOTO 4590
4580 T2(N1)=T2(N1-1)+L1
4590 REM
4600 IF N1>(N2-N6)GOTO 4620
4610 GOTO 4670
4620 IF N1 <> (N2-N6+1) GOTO 4640
4630 GOTO 4650
4640 N3=N3-1
```

```
4650 T1(N1)=T1(N1-1)+L1
4660 T2(N1)=T9
4670 REM
4680 IF N1 > N6 GOTO 4700
4690 GOTO 4740
4700 IF N1 <= (N2-N6) GOTO 4720
4710 GOTO 4740
4720 T1(N1)=T1(N1-1)+L1
4730 T2(N1)=T2(N1-1)+L1
4740 REM
4750 X1=N3
4760 X4=N6
4770 R0=X1/X4
4780 P(N1)=P5*R0*L1
4790 D(N1)=T2(N1)-T1(N1)
4800 N1=N1+1
4810 WEND
4820 RETURN
4830 REM  CALCONST
4840 X2=D1*D(N6)
4850 X5=T4*E3*(1-EXP(-X2))/X2
4860 FOR M=1 TO 10
4870 IF I(M)=0 GOTO 4890
4880 GOTO 4940
4890 X3=D1*L(M,2)
4900 IF M >= 6 GOTO 4920
4910 GOTO 4930
4920 X3=X3+X2
4930 F(M)=(EXP(X3)-X5)/(1-T4)
4940 NEXT M
4950 RETURN
4960 REM  MAINLOOP
4970 FOR N1=1 TO N2
4980 GOSUB 5550 'MAIN1
4990 FOR M=1 TO 11
5000 GOSUB 5680 'MAIN2
5010 IF M <> 11 GOTO 5030
5020 GOTO 5100
5030 V=Q(M)*P4*F1(M)/1000000!
5040 IF I(M) = 0 GOTO 5060
5050 GOTO 5070
5060 GOSUB 6120 'CAPITAL
5070 IF I(M)=1 GOTO 5090
5080 GOTO 5100
5090 GOSUB 6260 'EXPENSE
5100 REM
5110 IF I(M) = -1 GOTO 5130
5120 GOTO 5140
5130 GOSUB 6330 'PRODUCTION
5140 IF M >= 6 GOTO 5160
5150 GOTO 5190
5160 IF M <= 9 GOTO 5180
5170 GOTO 5190
5180 P6=-P6
```

```
5190 C3(M)=C3(M)+P6
5200 REM
5210 NEXT M
5220 R1=D1*D(N1)
5230 C9=C9+P(N1)*EXP(-D1*(T1(N1)+S1))*(1-EXP(-R1))/R1
5240 NEXT N1
5250 RETURN
5260 REM  HEADING
5270 PRINT #1,V$
5280 PRINT #1,V$;"_____________________________________________"
5290 PRINT #1,V$;"LEVELIZED FUEL CYCLE COSTS, MILLS/KWH"
5300 PRINT #1,V$;"_____________________________________________"
5310 PRINT #1,V$
5320 PRINT #1,V$;TAB(40) "CURRENT";TAB(60) "CONSTANT"
5330 PRINT #1,V$;TAB(40) "DOLLARS";TAB(60) "DOLLARS"
5340 RETURN
5350 REM  LEVEL
5360 C8=E4/(1-(1+E4) (-T9))
5370 X=(1+E4)/(1+R3)-1
5380 C7=X/(1-(1+X) (-T9))
5390 A1=(C7/C8)*(1+R3) (T8-S2)
5400 T0=0
5410 T7=0
5420 FOR M=1 TO 11
5430 C1(M)=C3(M)/C9
5440 T0=T0+C1(M)
5450 C2(M)=A1*C1(M)
5460 T7=T7+C2(M)
5470 NEXT M
5480 PRINT #1,V$
5490 FOR J=1 TO 11
5500 PRINT #1, USING U$(22); B$(J); C1(J); C2(J)
5510 NEXT J
5520 PRINT #1,V$
5530 PRINT #1, USING U$(23); T0; T7
5540 RETURN
5550 REM  MAIN1
5560 T3=T1(N1)+S2-T8
5570 GOSUB 5900 'USE
5580 Q(4)=A(3,N1)
5590 Q(5)=A(7,N1)
5600 Q(6)=0
5610 Q(7)=0
5620 Q(8)=0
5630 IF N4 <> 0 GOTO 5650
5640 GOTO 5660
5650 GOSUB 5990 'USE2
5660 Q(10)=A(7,N1)
5670 RETURN
5680 REM  MAIN2
5690 IF M >= 6 GOTO 5710
5700 GOTO 5720
5710 T3=T2(N1)+S2-T8
5720 REM
```

```
5730 IF N1 <= N6 GOTO 5750
5740 GOTO 5770
5750 B=L(M,1)
5760 GOTO 5780
5770 B=L(M,2)
5780 IF M <= 9 GOTO 5800
5790 GOTO 5860
5800 IF M <> 5 GOTO 5820
5810 GOTO 5840
5820 K=FNA(M,5)
5830 GOTO 5850
5840 K=5
5850 GOTO 5870
5860 K=M-4
5870 REM
5880 P4=P1(K)*(1+E(K)) (T3-B)
5890 RETURN
5900 REM  USE
5910 E2=A(2,N1)/A(1,N1)
5920 F3=(E2-T5)/(E1-T5)
5930 T6=F3-1
5940 S=T6*FNV(T5)+FNV(E2)-F3*FNV(E1)
5950 Q(1)=F3*2.5944*A(1,N1)
5960 Q(2)=F3*A(1,N1)
5970 Q(3)=S*A(1,N1)
5980 RETURN
5990 REM  USE2
6000 E2=A(5,N1)/A(4,N1)
6010 F3=(E2-T5)/(E1-T5)
6020 T6=F3-1
6030 S=T6*FNV(T5)+FNV(E2)-F3*FNV(E1)
6040 Q(6)=F3*2.5944*A(4,N1)
6050 Q(7)=F3*A(4,N1)
6060 Q(8)=S*A(4,N1)
6070 RETURN
6080 REM  BEGINEND
6090 X2=D1*D(N1)
6100 P6=V*EXP(-D1*T1(N1))*(EXP(D1*B)-T4*E3*(1-EXP(-X2))/X2)/(1-T4)
6110 RETURN
6120 REM  CAPITAL
6130 IF N1 < N6 GOTO 6150
6140 GOTO 6160
6150 GOSUB 6080 'BEGINEND
6160 IF N1 >= N6 GOTO 6180
6170 GOTO 6210
6180 IF N1 <= (N2-N6) GOTO 6200
6190 GOTO 6210
6200 P6=V*EXP(-D1*T1(N1))*F(M)
6210 IF N1 > (N2 - N6) GOTO 6230
6220 GOTO 6240
6230 GOSUB 6080
6240 REM
6250 RETURN
6260 REM  EXPENSE
```

```
6270 P6=V*EXP(-D1*(T1(N1)-B))
6280 IF M >= 6 GOTO 6300
6290 GOTO 6310
6300 P6=P6*EXP(-D1*D(N1))
6310 REM
6320 RETURN
6330 REM  PRODUCTION
6340 R2=D1-LOG(1+E(7))
6350 P6=P1(7)*P(N1)*EXP(-R2*(T1(N1)+S1))*(1-EXP(-R2*D(N1)))/(R2*D(N1))
6360 P6=P6*(1+E(7)) (S2-T8)
6370 RETURN
```

```
10 REM  FCRATE.BAS
20 REM  FIXED CHARGE RATE
40 WIDTH "LPT1:",80
50 OPEN "B:FCRATE.DAT" FOR OUTPUT AS #1
60 REM  A$                ANSWER
70 REM  A0                AITC
80 REM  B$
90 DIM  B$(4)
100 REM  B0                BLF
110 REM  B1                BYR
120 REM  C$
130 REM  C0                COM
140 REM  C1                CRC
150 REM  C2                CRF
160 REM  C3                CCRR
170 REM  C4                CLRR
180 REM  C5                CREV
190 DIM  C5(36)
200 REM  D$
210 REM  D0                DB
220 REM  D1                DSL
230 REM  D2                DCAP
240 REM  D3                DICC
250 REM  D4                DISC
260 REM  E0                ECOM
270 REM  E$
280 REM  E1                ECON
290 REM  E2                EQINT
300 REM  F$
310 REM  F                 F
320 REM  F0                FCR
330 REM  F1                FIR
340 REM  F2                FFAC
350 REM  F3                FR
360 DIM  F3(3)
370 REM  I                 I
380 REM  N0                NDP
390 REM  N1                NLF
400 REM  N2                NYR
410 REM  N3                NUM
420 REM  N$                NORM
430 REM  P0                PC
440 REM  P1                PX
450 REM  P2                PTR
460 REM  P3                PWC
470 REM  P4                PWF
480 REM  P5                PROP
490 DIM  P5(36)
500 REM  R$
510 REM  R0                RIR
520 REM  R1                ROC
530 REM  R2                REVC
540 REM  R3                RINV
550 REM  R4                RITC
```

```
560 REM  R5                RT
570 DIM  R5(3)
580 REM  R6                REPL
590 DIM  R6(36)
600 REM  R7                RBASE
610 DIM  R7(36)
620 REM  T                 TEFRA
630 DIM  T(36,4)
640 REM  T0                TC
650 REM  T1                TD
660 REM  T2                TXCAP
670 REM  T3                T
680 REM  U$
690 DIM  U$(50)
700 REM  V$                V
710 REM  X0                XITC
720 REM  X1                XPROP
730 REM  X2                XREPL
740 PRINT TAB(20) "FIXED CHARGE RATE"
750 PRINT
760 REM  GET TODAY'S DATE
770 FOR I=1 TO 4
780 PRINT
790 NEXT I
800 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
810 INPUT D$
820 V$="     "
830 E$="     YR  RATE   RETURN BOOK  TAX   I TAX I TAX PROP  INTRM REV
R  REV R"
840 F$="          BASE   ON CAP DEPR  DEPR  CURR  DEFER TAX   REPL
CURR   CONST"
850 C$="&##. #####. #####.  ####.  ####.  ####.  ####.  ####.  ####.
#####.  ##
###."
860 N1=30
870 N2=30
880 F=1.06
890 F1=1.06
900 T3=.4816
910 R3=1000
920 F2=.729
930 R4=.08
940 DATA .1,.09,.14
950 FOR I=1 TO 3
960 READ R5(I)
970 NEXT I
980 DATA .5,.12,.38
990 FOR I=1 TO 3
1000 READ F3(I)
1010 NEXT I
1020 U$(1)="              RUN DATE &"
1030 U$(2)="     PROJECT LIFE (years)
##."
1040 U$(3)="     LEVELIZING PERIOD (years)
```

```
##."
1050 U$(4)="      INFLATION FACTOR (1 + rate)
#.##"
1060 U$(5)="      INTERIM REPLACEMENT ESCALATION FACTOR (1 + rate)
#.##"
1070 U$(6)="      EFFECTIVE INCOME TAX RATE
.####"
1080 U$(7)="      TOTAL INITIAL CAPITAL INVESTMENT (dollars)
#####."
1090 U$(8)="      TAX DEDUCTABLE FRACTION OF TOTAL CAPITAL INVEST.
.####"
1100 U$(9)="      INVESTMENT TAX CREDIT RATE
.##"
1110 U$(10)="      INTEREST RATE ON DEBT
.####"
1120 U$(11)="      RETURN ON PREFERRED STOCK
.####"
1130 U$(12)="      RETURN ON COMMON STOCK
.####"
1140 U$(13)="      DEBT FRACTION
.####"
1150 U$(14)="      PREFERRED STOCK FRACTION
.####"
1160 U$(15)="      COMMON STOCK FRACTION
.####"
1170 U$(16)="      PROPERTY TAX RATE
.##"
1180 U$(17)="      INTERIM REPLACEMENT RATE
.##"
1190 U$(18)="      INVESTMENT TAX CREDIT RATE
#.##"
1200 U$(19)="      INTEREST RATE ON DEBT
.####"
1210 U$(20)="      RETURN ON PREFERRED STOCK
.####"
1220 U$(21)="      RETURN ON COMMON STOCK
.####"
1230 U$(22)="      DEBT FRACTION
.####"
1240 U$(23)="      PREFERRED STOCK FRACTION
.####"
1250 U$(24)="      COMMON STOCK FRACTION
.####"
1260 U$(25)="      PROPERTY TAX RATE
#.##"
1270 U$(26)="      INTERIM REPLACEMENT RATE
#.###"
1280 U$(27)="           ##.## PERCENT COST OF MONEY #####."
1290 U$(28)="           CURRENT DOLLAR RATE  = .####"
1300 U$(29)="           CONSTANT DOLLAR RATE = .####"
1310 P2=.02
1320 RO=.005
1330 N$="N"
1340 NO=3
```

```
1350 B$(1)="      3-YEAR PROPERTY"
1360 B$(2)="      5-YEAR PROPERTY"
1370 B$(3)="      10-YEAR PROPERTY"
1380 B$(4)="      15-YEAR PUBLIC UTILITY PROPERTY"
1390 REM
1400 T(1,1)=.25
1410 T(2,1)=.38
1420 T(3,1)=.37
1430 FOR I=4 TO 36
1440 T(I,1)=0
1450 NEXT I
1460 REM
1470 T(1,2)=.15
1480 T(2,2)=.22
1490 FOR I=3 TO 5
1500 T(I,2)=.21
1510 NEXT I
1520 FOR I=6 TO 36
1530 T(I,2)=0
1540 NEXT I
1550 REM
1560 T(1,3)=.08
1570 T(2,3)=.14
1580 T(3,3)=.12
1590 FOR I=4 TO 6
1600 T(I,3)=.1
1610 NEXT I
1620 FOR I=7 TO 10
1630 T(I,3)=9.000001E-02
1640 NEXT I
1650 FOR I=11 TO 36
1660 T(I,3)=0
1670 NEXT I
1680 REM
1690 T(1,4)=.05
1700 T(2,4)=.1
1710 T(3,4)=9.000001E-02
1720 T(4,4)=.08
1730 T(5,4)=.07
1740 T(6,4)=.07
1750 FOR I=7 TO 15
1760 T(I,4)=.06
1770 NEXT I
1780 FOR I=16 TO 36
1790 T(I,4)=0
1800 NEXT I
1810 PRINT "      DO YOU WANT YEAR BY YEAR PRINTOUT OF RETURN, RATE BASE,
TAXES,
1820 PRINT "      REVENUE REQUIREMENTS?"
1830 PRINT "      ANSWER Y OR N"
1840 INPUT A$
1850 IF A$="Y" GOTO 1900
1860 IF A$="y" GOTO 1900
1870 IF A$="N" GOTO 1900
```

```
1880 IF A$="n" GOTO 1900
1890 GOTO 1810
1900 REM
1910 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1920 PRINT
1930 PRINT "     0 = RUN CASE, DATA ENTRY COMPLETE"
1940 PRINT "     1 = PROJECT LIFE YEARS";N1
1950 PRINT "         LEVELIZING PERIOD YEARS";N2
1960 PRINT "     2 = INFLATION FACTOR (1 + rate)";F
1970 PRINT "     3 = INTERIM REPLACEMENT ESCALATION FACTOR";F1
1980 PRINT "     4 = EFFECTIVE INCOME TAX RATE";T3
1990 PRINT "     5 = TOTAL INITIAL CAPITAL INVESTMENT, DOLLARS";R3
2000 PRINT "     6 = TAX DEDUCTABLE FRACTION OF TOTAL CAPITAL
INVESTMENT";F2
2010 PRINT "     7 = INVESTMENT TAX CREDIT RATE";R4
2020 PRINT "     8 = INTEREST RATE ON DEBT";R5(1)
2030 PRINT "         RETURN ON PREFERRED STOCK";R5(2)
2040 PRINT "         RETURN ON COMMON STOCK";R5(3)
2050 PRINT "     9 = DEBT FRACTION";F3(1)
2060 PRINT "         PREFERRED STOCK FRACTION";F3(2)
2070 PRINT "         COMMON STOCK FRACTION";F3(3)
2080 PRINT "     10 = PROPERTY TAX RATE";P2
2090 PRINT "     11 = INTERIM REPLACEMENT RATE";RO
2100 PRINT "     12 = NORMALIZED/FLOW-THROUGH ACCOUNTING ";N$
2110 PRINT "     13 = TEFRA DEPRECIATION SCHEDULE";NO
2120 PRINT "     ";B$(NO)
2130 PRINT "     99 = EXIT PROGRAM"
2140 PRINT V$
2150 PRINT "     ENTER A NUMBER FROM THE MENU"
2160 INPUT N3
2170 IF N3=0 GOTO 2850
2180 IF N3=1 GOTO 2330
2190 IF N3=2 GOTO 2380
2200 IF N3=3 GOTO 2410
2210 IF N3=4 GOTO 2440
2220 IF N3=5 GOTO 2470
2230 IF N3=6 GOTO 2500
2240 IF N3=7 GOTO 2530
2250 IF N3=8 GOTO 2560
2260 IF N3=9 GOTO 2630
2270 IF N3=10 GOTO 2690
2280 IF N3=11 GOTO 2720
2290 IF N3=12 GOTO 2750
2300 IF N3=13 GOTO 2790
2310 IF N3 > 13 GOTO 4120
2320 IF N3 < 0 GOTO 2850
2330 PRINT "     INPUT PROJECT LIFE (years)"
2340 INPUT N1
2350 PRINT "     INPUT LEVELIZING PERIOD (years)"
2360 INPUT N2
2370 GOTO 1910
2380 PRINT "     INPUT INFLATION FACTOR (1 + F)"
2390 INPUT F
```

```
2400 GOTO 1910
2410 PRINT "     INPUT INTERIM REPLACEMENT ESCALATION FACTOR (1 + F)"
2420 INPUT F1
2430 GOTO 1910
2440 PRINT "     INPUT EFFECTIVE INCOME TAX RATE"
2450 INPUT T3
2460 GOTO 1910
2470 PRINT "     INPUT TOTAL CAPITAL INVESTMENT"
2480 INPUT R3
2490 GOTO 1910
2500 PRINT "     INPUT DEDUCTABLE FRACTION OF TOTAL CAPITAL INVESTMENT"
2510 INPUT F2
2520 GOTO 1910
2530 PRINT "     INPUT INVESTMENT TAX CREDIT RATE AS A DECIMAL FRACTION"
2540 INPUT R4
2550 GOTO 1910
2560 PRINT "     INPUT INTEREST RATE ON DEBT AS A DECIMAL FRACTION"
2570 INPUT R5(1)
2580 PRINT "     INPUT RETURN ON PREFERRED STOCK AS A DECIMAL FRACTION"
2590 INPUT R5(2)
2600 PRINT "     INPUT RETURN ON COMMON STOCK AS A DECIMAL FRACTION"
2610 INPUT R5(3)
2620 GOTO 1910
2630 PRINT "     INPUT DEBT FRACTION (decimal)"
2640 INPUT F3(1)
2650 PRINT "     INPUT PREFERRED STOCK FRACTION (decimal)"
2660 INPUT F3(2)
2670 F3(3)=1-F3(1)-F3(2)
2680 GOTO 1910
2690 PRINT "     INPUT PROPERTY TAX RATE AS A DECIMAL FRACTION"
2700 INPUT P2
2710 GOTO 1910
2720 PRINT "     INPUT INTERIM REPLACEMENT RATE AS A DECIMAL FRACTION"
2730 INPUT R0
2740 GOTO 1910
2750 PRINT "     INPUT N FOR NORMALIZED ACCOUNTING"
2760 PRINT "        OR F FOR FLOW-THROUGH ACCOUNTING"
2770 INPUT N$
2780 GOTO 1910
2790 PRINT "     INPUT 1 FOR 3-YEAR PROPERTY"
2800 PRINT "           2 FOR 5-YEAR PROPERTY"
2810 PRINT "           3 FOR 10-YEAR PROPERTY"
2820 PRINT "           4 FOR 15-YEAR PUBLIC UTILITY PROPERTY"
2830 INPUT N0
2840 GOTO 1910
2850 PRINT
2860 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
2870 INPUT R$
2880 PRINT #1,"      F I X E D   C H A R G E   R A T E"
2890 PRINT #1,V$
2900 PRINT #1,"                VERSION 1/10/85"
2910 PRINT #1, USING U$(1);D$
2920 PRINT #1,V$
2930 PRINT #1, V$; R$
```

```
2940 PRINT #1, V$
2950 PRINT #1,V$;"INPUT DATA"
2960 PRINT #1,V$;"__________"
2970 PRINT #1,V$
2980 PRINT #1, USING U$(2); N1
2990 PRINT #1, USING U$(3); N2
3000 PRINT #1, USING U$(4); F
3010 PRINT #1, USING U$(5); F1
3020 PRINT #1, USING U$(6); T3
3030 PRINT #1, USING U$(7); R3
3040 PRINT #1, USING U$(8); F2
3050 PRINT #1, USING U$(18); R4
3060 PRINT #1, USING U$(19); R5(1)
3070 PRINT #1, USING U$(20); R5(2)
3080 PRINT #1, USING U$(21); R5(3)
3090 PRINT #1, USING U$(22); F3(1)
3100 PRINT #1, USING U$(23); F3(2)
3110 PRINT #1, USING U$(24); F3(3)
3120 PRINT #1, USING U$(25); P2
3130 PRINT #1, USING U$(26); R0
3140 IF N$="N" GOTO 3160
3150 IF N$="F" GOTO 3180
3160 PRINT #1,V$;"NORMALIZED ACCOUNTING"
3170 GOTO 3190
3180 PRINT #1,V$;"FLOW-THROUGH ACCOUNTING"
3190 PRINT
3200 PRINT #1,V$;"ACRS CLASS: ";B$(N0)
3210 PRINT #1,V$
3220 E2=F3(2)*R5(2)+F3(3)*R5(3)
3230 C0=F3(1)*R5(1)+E2
3240 P4=1+(C0-T3*F3(1)*R5(1))
3250 D2=F2*R3
3260 E0=(P4-1)*100
3270 P3=1+(P4-F)/F
3280 E1=(P3-1)*100
3290 B0=N1
3300 B1=N2
3310 X0=D2*R4
3320 D1=D2/B0
3330 D0=R3/B0
3340 P1=0
3350 P0=0
3360 IF N$ = "F" GOTO 3400
3370 IF N$ = "f" GOTO 3400
3380 GOTO 3390
3390 A0=X0/B0
3400 X2=R0*R3
3410 X1=P2*R3
3420 IF A$ = "N" GOTO 3470
3430 IF A$ = "n" GOTO 3470
3440 PRINT #1, CHR$(12)
3450 PRINT #1, E$
3460 PRINT #1, F$
3470 FOR I=1 TO N2
```

```
3480 T2=D2*T(I,N0)
3490 IF I=1 GOTO 3510
3500 IF I>1 GOTO 3650
3510 REM  YEAR1
3520 IF N$="F" GOTO 3560
3530 IF N$="f" GOTO 3560
3540 IF N$="N" GOTO 3600
3550 IF N$="n" GOTO 3600
3560 REM  FLOW-THROUGH
3570 R7(I)=R3
3580 T0=T3*(D0-T2+E2*R7(I))/(1-T3)-X0/(1-T3)
3590 GOTO 3640
3600 REM  NORMALIZED
3610 T1=T3*(T2-D1)
3620 R7(I)=R3-X0
3630 T0=T3*(D0-T2+E2*R7(I)+T1)/(1-T3)
3640 GOTO 3760
3650 REM  LATER
3660 IF N$="F" GOTO 3700
3670 IF N$="f" GOTO 3700
3680 IF N$="N" GOTO 3730
3690 IF N$="n" GOTO 3730
3700 R7(I)=R7(I-1)-D0
3710 T0=T3*(D0-T2+E2*R7(I))/(1-T3)
3720 GOTO 3760
3730 R7(I)=R7(I-1)-(D0+T1)+A0
3740 T1=T3*(T2-D1)
3750 T0=T3*(D0-T2+E2*R7(I)+T1)/(1-T3)
3760 REM  SECT03
3770 R1=C0*R7(I)
3780 R6(I)=X2*F1 I
3790 P5(I)=X1
3800 C5(I)=R1+D0+T1+T0+R6(I)+P5(I)
3810 R2=C5(I)*F (-I)
3820 D4=P4 (-I)
3830 P1=C5(I)*P4 (-I)+P1
3840 D3=P3 (-I)
3850 P0=P0+R2*D3
3860 C2=(P4-1)/(1-D4)
3870 C4=P1*C2/R3
3880 C1=(P3-1)/(1-D3)
3890 C3=P0*C1/R3
3900 IF A$="Y" GOTO 3930
3910 IF A$="y" GOTO 3930
3920 GOTO 3940
3930 PRINT #1, USING C$;V$; I;R7(I);R1;D0;T2;T0;T1;P5(I);R6(I);C5(I);R2
3940 NEXT I
3950 IF A$ <> "Y" GOTO 4030
3960 PRINT #1,V$
3970 PRINT #1,"     SUM OF THE PRESENT WORTH OF REVENUE REQUIREMENTS AT"
3980 PRINT #1,V$
3990 PRINT #1, USING U$(27); E0;P1
4000 PRINT #1,V$
4010 PRINT #1, USING U$(27); E1;P0
```

```
4020 PRINT #1,V$
4030 PRINT
4040 PRINT #1,V$;"      FIXED CHARGE RATE"
4050 PRINT #1,V$
4060 C2=(P4-1)/(1-P4 (-B1))
4070 F0=P1*C2/R3
4080 PRINT #1, USING U$(28);F0
4090 PRINT #1, USING U$(29);C3
4100 PRINT #1, CHR$(12)
4110 GOTO 1910
4120 CLOSE #1
4130 END
```

```
10 REM  LEVEL.BAS
20 REM  LEVELIZED POWER GENERATION COSTS FOR LIGHT-WATER-REACTOR
30 REM  AND COAL-FIRED POWER PLANTS
50 WIDTH "LPT1:",80
60 OPEN "LPT1:" FOR OUTPUT AS #1
70 DEF FNU(A1,A2)=((1+A1) A2-1)/(A1*(1+A1) A2)
80 DEF FNC(A1,A2)=1/FNU(A1,A2)
90 DEF FNS(A1,A2)=A1/((1+A1) A2-1)
100 PRINT TAB(20) "LEVELIZED POWER GENERATION COSTS" : PRINT
110 REM  GET TODAY'S DATE
120 FOR K=1 TO 4
130 PRINT
140 NEXT K
150 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
160 INPUT D$
170 REM  A$  ANSWER
180 REM  B$
190 REM  B0  BRETURN
200 REM  B8  BFRACT
210 REM  C1  CAPFACTOR
220 REM  C2  CAPINVEST
230 REM  D$  RUN DATE
240 REM  D7  DECOM
250 REM  E$
260 REM  E0  ERETURN
270 REM  E8  EFRACT
280 REM  F$
290 REM  F0  FCRATE
300 REM  F1  FEDDEBTRATE
310 REM  G   GNPINFLATIONRATE
320 REM  I   ILIFE
330 REM  L   PLANTLIFE
340 REM  N   NUM
350 REM  P   P
360 DIM  P(40)
370 REM  P0  POBAR
380 REM  P1  PDCBAR
390 REM  P2  PFRACT
400 REM  P3  POCBAR
410 REM  P4  PWRR
420 REM  P5  POFBAR
430 REM  P6  POMBAR
440 REM  P7  PCBAR
450 REM  P8  PFBAR
460 REM  P9  PBAR
470 REM  Q1  PODCBAR
480 REM  Q2  POOMBAR
490 REM  Q3  PRETURN
500 REM  R   R
510 DIM  R(40)
520 REM  R1  RATIO
530 REM  R2  RATING
540 REM  R$
550 REM  S   S
```

```
560 DIM  S(40)
570 REM  T$  TYPEP
580 REM  T1  TAWACM
590 REM  T2  TSTATE
600 REM  T3  TOTCURR
610 REM  T4  TFEDERAL
620 REM  T5  TOTCONST
630 REM  T6  TEFFECTIVE
640 REM  U   UNITS
650 REM  U$
660 DIM  U$(50)
670 REM  V$  5 BLANKS
680 REM  W   PWPOWER
690 REM  Y   YEAR
700 REM  Y0  YEAROP
710 REM  Y1  YEARCONST
720 REM  Y2  YEARSTOREF
730 V$="     "
740 B$="     PLANT TYPE                                NUCLEAR"
750 U$(1)="     YEAR OF FIRST COMMERCIAL OPERATION        ####."
760 U$(2)="     RATING PER UNIT (MWe)                     ####."
770 U$(3)="     UNITS PER PLANT                              #."
780 U$(4)="     PLANT LIFE                                  ##."
790 U$(5)="     GNP INFLATION RATE                       #.##"
800 U$(7)="     STATE INCOME TAX RATE                    #.##"
810 U$(8)="     FEDERAL INCOME TAX RATE                  #.##"
820 U$(9)="     EFFECTIVE INCOME TAX RATE               #.####"
830 U$(10)="     RETURN ON COMMON STOCK                   #.##"
840 U$(11)="     COMMON STOCK FRACTION                    #.##"
850 U$(12)="     INTEREST RATE ON DEBT                    #.##"
860 U$(13)="     DEBT FRACTION                            #.##"
870 U$(14)="     RETURN ON PREFERRED STOCK                #.##"
880 U$(15)="     PREFERRED STOCK FRACTION                 #.##"
890 U$(16)="     EFFECTIVE COST OF MONEY                 .####"
900 U$(17)="     CONSTANT DOLLAR LEVELIZED COST YEAR      ####."
910 U$(18)="     FIXED CHARGE RATE                       #.###"
920 E$="$"
930 U$(19)="     PLANT INVESTMENT COST (####. &millions)   #####."
940 U$(20)="     CAPACITY FACTOR                          #.##"
950 U$(21)="     FEDERAL GOVERNMENT DEBT RATE            #.###"
960 U$(22)="     DECOMMISSIONING COST (####. &millions)    #####."
970 F$="&"
980 U$(23)="     LEVELIZED O&M COST (####. mills/kWh)     ###.##"
990 U$(24)="     LEVELIZED FUEL COST (####. mills/kWh)    ###.##"
1000 U$(25)="     CAPITAL        ###.#                 ###.#"
1010 U$(26)="     O&M            ###.#                 ###.#"
1020 U$(27)="     FUEL           ###.#                 ###.#"
1030 U$(28)="     DECOM.         ###.#                 ###.#"
1040 U$(29)="                    ###.#                 ###.#"
1050 REM  INIT01
1060 T$="N"
1070 Y0=1995
1080 R2=1100
1090 U=1
```

```
1100 L=30
1110 G=.06
1120 R3=.01
1130 T2=.04
1140 T4=.46
1150 E0=.14
1160 E8=.38
1170 B0=.1
1180 B8=.5
1190 Q3=9.000001E-02
1200 REM  INIT02
1210 Y1=1983
1220 F0=.1671
1230 C2=3398!
1240 C1=.65
1250 F1=.085
1260 D7=130
1270 Q2=6.61
1280 P5=8.78
1290 REM <<<<<=====START OF MENU READ
1300 REM  MEN1
1310 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1320 PRINT "     0 = RUN CASE, DATA ENTRY COMPLETE"
1330 PRINT "     1 = PLANT TYPE ";T$
1340 PRINT "     2 = YEAR OF FIRST COMMERCIAL OPERATION";Y0
1350 PRINT "     3 = RATING ";R2; " & UNITS/PLANT ";U
1360 PRINT "     4 = PLANT LIFE";L
1370 PRINT "     5 = GNP INFLATION RATE";G
1380 PRINT "     6 = not in use"
1390 PRINT "     7 = STATE INCOME TAX RATE";T2
1400 PRINT "     8 = FEDERAL INCOME TAX RATE";T4
1410 U$(30)="     9 = RETURN ON COMMON STOCK  #.##"
1420 PRINT USING U$(30); E0
1430 PRINT "     10 = COMMON STOCK FRACTION";E8
1440 PRINT "     11 = INTEREST RATE ON DEBT";B0
1450 REM  MEN2
1460 PRINT "     12 = DEBT FRACTION";B8
1470 U$(31)="     13 = RETURN ON PREFERRED STOCK  #.##"
1480 PRINT USING U$(31); Q3
1490 PRINT "     14 = REFERENCE YEAR FOR CONSTANT DOLLAR COSTS";Y1
1500 PRINT "     15 = FIXED CHARGE RATE";F0
1510 PRINT "     16 = PLANT INVESTMENT COST";C2
1520 PRINT "     17 = CAPACITY FACTOR";C1
1530 PRINT "     18 = DECOMMISSIONING DEBT RATE";F1
1540 PRINT "     19 = DECOMMISSIONING COST";D7
1550 PRINT "     20 = O&M COST";Q2
1560 PRINT "     21 = FUEL COST";P5
1570 PRINT "     99 = EXIT PROGRAM"
1580 PRINT "     ENTER A NUMBER FROM THE MENU"
1590 INPUT N
1600 REM  MEN3
1610 IF N=0 GOTO 2710
1620 IF N=1 GOTO 1840
```

```
1630 IF N=2 GOTO 2080
1640 IF N=3 GOTO 2110
1650 IF N=4 GOTO 2160
1660 IF N=5 GOTO 2190
1670 IF N=6 GOTO 2220
1680 IF N=7 GOTO 2240
1690 IF N=8 GOTO 2270
1700 IF N=9 GOTO 2300
1710 IF N=10 GOTO 2330
1720 IF N=11 GOTO 2360
1730 IF N=12 GOTO 2390
1740 IF N=13 GOTO 2420
1750 IF N=14 GOTO 2450
1760 IF N=15 GOTO 2480
1770 IF N=16 GOTO 2510
1780 IF N=17 GOTO 2550
1790 IF N=18 GOTO 2580
1800 IF N=19 GOTO 2610
1810 IF N=20 GOTO 2640
1820 IF N=21 GOTO 2670
1830 IF N>21 GOTO 3570
1840 PRINT "      INPUT PLANT TYPE:"
1850 PRINT V$;"      N = NUCLEAR"
1860 PRINT V$;"      C = COAL-FIRED"
1870 INPUT T$
1880 IF T$ = "C" GOTO 1910
1890 IF T$ = "c" GOTO 1910
1900 GOTO 2050
1910 PRINT "      DO YOU WANT TO RESET TO COAL-FIRED DEFAULT VALUES? (Y
OR N)"
1920 INPUT A$
1930 IF A$="N" GOTO 2050
1940 IF A$="n" GOTO 2050
1950 REM  INIT03
1960 B$="      PLANT TYPE                                COAL-FIRED"
1970 R2=550
1980 U=2
1990 F0=.169
2000 C2=2763!
2010 D7=0
2020 Q2=5.17
2030 P5=23.4
2040 GOTO 1300
2050 REM  NUCLEAR
2060 B$="      PLANT TYPE                                  NUCLEAR"
2070 GOTO 1300
2080 PRINT "      INPUT YEAR OF FIRST COMMERCIAL OPERATION"
2090 INPUT Y0
2100 GOTO 1300
2110 PRINT "      INPUT RATING (MWe)"
2120 INPUT R2
2130 PRINT "      INPUT NUMBER OF UNITS PER PLANT"
2140 INPUT U
2150 GOTO 1300
```

```
2160 PRINT "      INPUT PLANT LIFE (years)"
2170 INPUT L
2180 GOTO 1300
2190 PRINT "      INPUT GNP INFLATION RATE (decimal)"
2200 INPUT G
2210 GOTO 1300
2220 PRINT "      MENU ITEM 6 NOT IN USE"
2230 GOTO 1300
2240 PRINT "      INPUT STATE INCOME TAX RATE (decimal)"
2250 INPUT T2
2260 GOTO 1300
2270 PRINT "      INPUT FEDERAL INCOME TAX RATE (decimal)"
2280 INPUT T4
2290 GOTO 1300
2300 PRINT "      INPUT RETURN ON COMMON STOCK (decimal)"
2310 INPUT E0
2320 GOTO 1300
2330 PRINT "      INPUT COMMON STOCK FRACTION (decimal)"
2340 INPUT E8
2350 GOTO 1300
2360 PRINT "      INPUT INTEREST RATE ON DEBT (decimal)"
2370 INPUT B0
2380 GOTO 1300
2390 PRINT "      INPUT DEBT FRACTION (decimal)"
2400 INPUT B8
2410 GOTO 1300
2420 PRINT "      INPUT RETURN ON PREFERRED STOCK (decimal)"
2430 INPUT Q3
2440 GOTO 1300
2450 PRINT "      INPUT YEAR FOR CONSTANT DOLLAR COSTS"
2460 INPUT Y1
2470 GOTO 1300
2480 PRINT "      INPUT FIXED CHARGE RATE (decimal)"
2490 INPUT F0
2500 GOTO 1300
2510 PRINT "      INPUT PLANT INVESTMENT COST AT YEAR OF FIRST
COMMERCIAL"
2520 PRINT "      OPERATION (";Y0;") $millions"
2530 INPUT C2
2540 GOTO 1300
2550 PRINT "      INPUT CAPACITY FACTOR (decimal)"
2560 INPUT C1
2570 GOTO 1300
2580 PRINT "      INPUT FEDERAL GOVERNMENT DEBT RATE (decimal)"
2590 INPUT F1
2600 GOTO 1300
2610 PRINT "      INPUT DECOMMISSIONING COST IN ";Y1;" $millions"
2620 INPUT D7
2630 GOTO 1300
2640 PRINT "      INPUT CONSTANT DOLLAR LEVELIZED O&M COST IN ";Y1"
mills/kWh"
2650 INPUT Q2
2660 GOTO 1300
2670 PRINT "      INPUT CONSTANT DOLLAR LEVELIZED FUEL COST IN ";Y1;"
```

```
mills/kWh
2680 INPUT P5
2690 GOTO 1300
2700 REM <<<<<=====END OF MENU READ
2710 I=L
2720 T6=T2 + (1-T2) * T4
2730 P2=1-E8-B8
2740 T1=E8*E0+B8*B0*(1-T6)+Q3*P2
2750 Y2=Y0-Y1
2760 FOR Y=1 TO I
2770 S(Y)=1
2780 P(Y)=1
2790 NEXT Y
2800 P4=0
2810 W=0
2820 FOR Y=1 TO I
2830 P(Y)=P(Y)*(1+G) Y
2840 R(Y)=P(Y)*S(Y)
2850 P4=P4+R(Y)/(1+T1) Y
2860 W=W+S(Y)/(1+T1) Y
2870 NEXT Y
2880 P9=P4/W
2890 REM  CALC02
2900 P0=((1+G)  (-Y2))*P9*FNC((T1-G)/(1+G),L)/FNC(T1,L)
2910 R1=P0/P9
2920 P7=F0*C2*1000000!/(8760*R2*U*C1)
2930 P3=R1*P7
2940 P6=Q2/R1
2950 P8=P5/R1
2960 IF T$="N" GOTO 2980
2970 GOTO 3010
2980 P1=FNS(F1,L)*((1+G) (Y2+L))*D7*1000000!/(8760*C1*R2*U)
2990 Q1=R1*P1
3000 GOTO 3030
3010 P1=0
3020 Q1=0
3030 REM  END IF IF-THEN-ELSE
3040 T3=P7+P6+P8+P1
3050 T5=P3+Q2+P5+Q1
3060 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
3070 INPUT R$
3080 PRINT #1,V$;"L E V E L I Z E D  P O W E R  G E N E R A T I O N
C O S T"
3090 PRINT #1,V$
3100 PRINT #1,V$;"                    VERSION 1/14/85"
3110 PRINT #1,V$;"                   RUN DATE ";D$
3120 PRINT #1,V$
3130 PRINT #1,V$;R$
3140 PRINT #1, B$
3150 PRINT #1, USING U$(1); Y0
3160 PRINT #1, USING U$(2); R2
3170 PRINT #1, USING U$(3); U
3180 PRINT #1, USING U$(4); L
3190 PRINT #1, USING U$(5); G
```

```
3200 PRINT #1, USING U$(7); T2
3210 PRINT #1, USING U$(8); T4
3220 PRINT #1, USING U$(9); T6
3230 PRINT #1, USING U$(10); E0
3240 PRINT #1, USING U$(11); E8
3250 PRINT #1, USING U$(12); B0
3260 PRINT #1, USING U$(13); B8
3270 PRINT #1, USING U$(14); Q3
3280 PRINT #1, USING U$(15); P2
3290 PRINT #1, USING U$(16); T1
3300 PRINT #1, USING U$(17); Y1
3310 PRINT #1, USING U$(18); F0
3320 PRINT #1, USING U$(19);Y0;E$;C2
3330 PRINT #1, USING U$(20); C1
3340 IF T$="N" GOTO 3370
3350 IF T$="n" GOTO 3370
3360 GOTO 3390
3370 PRINT #1, USING U$(21); F1
3380 PRINT #1, USING U$(22); Y1; E$; D7
3390 PRINT #1, USING U$(23);F$;Y1;Q2
3400 PRINT #1, USING U$(24); Y1; P5
3410 PRINT #1,V$
3420 PRINT #1,V$;"LEVELIZED POWER GENERATION COSTS (mills/kWh)"
3430 PRINT #1,V$
3440 PRINT #1,V$;TAB(20) "CONSTANT";TAB(40) "CURRENT"
3450 PRINT #1,V$
3460 PRINT #1, USING U$(25); P3; P7
3470 PRINT #1, USING U$(26); F$; Q2; P6
3480 PRINT #1, USING U$(27); P5; P8
3490 IF T$="N" GOTO 3520
3500 IF T$="n" GOTO 3520
3510 GOTO 3530
3520 PRINT #1, USING U$(28); Q1; P1
3530 PRINT #1,V$
3540 PRINT #1, USING U$(29); T5; T3
3550 PRINT #1, CHR$(12)
3560 GOTO 1290
3570 CLOSE #1
3580 END
```

```
10 REM  COACAP.BAS
20 REM  CAPITAL INVESTMENT COST FOR COAL-FIRED POWER PLANTS
40 WIDTH "LPT1:",80
50 OPEN "B:COACAP.DAT" FOR OUTPUT AS #1
60 DIM C4(7)
70 DIM C7(4)
80 DIM V1(15)
90 DIM U$(50)
100 DIM T3$(11)
110 DIM E1(7)
120 DIM L1(7)
130 DIM M1(7)
140 DIM S2(7)
150 DIM I3(4)
160 DIM S3(4)
170 DIM T1$(11)
180 DIM M3(12)
190 DIM N6(4)
200 DIM D4(4)
210 DIM M1$(11)
220 U$(1)="     # UNIT PLANT CAPITAL INVESTMENT   (####. $/kWe)   ####."
230 U$(2)="     TOTAL CAPITAL INVESTMENT MIDDLETOWN                ####."
240 U$(3)="     TOTAL INTEREST DURING CONSTRUCTION                 ####."
250 U$(4)="     TOTAL ESCALATED DIRECT AND INDIRECT COSTS          ####."
260 U$(5)="     YEAR OF STEAM SUPPLY SYSTEM PURCHASE          ####."
270 U$(6)="     SUBTOTAL DIRECTS                                   ####."
280 U$(7)="     SUBTOTAL INDIRECTS                                 ####."
290 U$(8)="     SUBTOTAL DIRECT AND INDIRECT                       ####."
300 U$(9)="     CONTINGENCY ALLOWANCE                              ####."
310 U$(10)="     TOTAL DIRECT AND INDIRECT BEFORE ESCALATION        ####."
320 U$(11)="     ESCALATION DURING CONSTRUCTION                     ####."
330 U$(12)="     PLANT LOCATION ADJUSTMENT &          #####."
340 U$(13)="     PLANT LOCATION                       & "
350 PRINT TAB(11) "COAL-FIRED POWER PLANT CAPITAL INVESTMENT COSTS"
360 PRINT
370 REM  GET TODAYS DATE
380 FOR I=1 TO 4
390 PRINT
400 NEXT I
410 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
420 INPUT T4$
430 PRINT
440 PRINT
450 REM  SET DEFAULT VALUES
460 V$="      "
470 V2$="            "
480 V3$="                 "
490 P=3.14159
500 B1=550
510 Y4=1983
520 R2=2738/2722
530 R1=0
540 Y1=1989
550 V1(1)=Y1
```

```
560 Y2=1991
570 V1(2)=Y2
580 Y3=1995
590 V1(3)=Y3
600 I1=9
610 V1(5)=I1
620 E2=7
630 V1(6)=E2
640 C1=10
650 V1(7)=C1
660 C2=5
670 V1(9)=C2
680 S1=550
690 V1(8)=S1
700 V1(11)=Y4
710 REM  CITY MULTIPLIERS
720 M3(1)=1
730 M3(2)=.9/R2
740 M3(3)=.95/R2
750 M3(4)=1!/R2
760 M3(5)=1!/R2
770 M3(6)=.94/R2
780 M3(7)=.96/R2
790 M3(8)=.96/R2
800 M3(9)=1.04/R2
810 M3(10)=1.07/R2
820 M3(11)=1.03/R2
830 REM READ DATA
840 FOR I=1 TO 11
850 READ T3$(I)
860 NEXT I
870 FOR I=1 TO 7
880 READ E1(I)
890 R1=R1+E1(I)
900 NEXT I
910 FOR I=1 TO 7
920 READ L1(I)
930 R1=R1+L1(I)
940 NEXT I
950 FOR I=1 TO 7
960 READ M1(I)
970 R1=R1+M1(I)
980 NEXT I
990 FOR I=1 TO 7
1000 READ S2(I)
1010 NEXT I
1020 FOR I=1 TO 4
1030 READ I3(I)
1040 R1=R1+I3(I)
1050 NEXT I
1060 V1(10)=R1
1070 FOR I=1 TO 4
1080 READ S3(I)
1090 NEXT I
```

```
1100 T1$(1)="          20 LAND                          ####."
1110 T1$(2)="          21 STRUCTURES                    ####."
1120 T1$(3)="          22 BOILER PLANT                  ####."
1130 T1$(4)="          23 TURBINE PLANT                 ####."
1140 T1$(5)="          24 ELECTRIC PLANT                ####."
1150 T1$(6)="          25 MISC PLANT                    ####."
1160 T1$(7)="          26 MAIN COND HEAT REJ            ####."
1170 T1$(8)="          91 CONSTR SERVICES               ####."
1180 T1$(9)="          92 HOME OFFICE ENGRG             ####."
1190 T1$(10)="          93 FIELD OFFICE                  ####."
1200 T1$(11)="          94 OWNER COSTS                   ####."
1210 FOR I=1 TO 4
1220 READ M7(I)
1230 NEXT I
1240 REM T3$
1250 DATA "MIDDLETOWN   "
1260 DATA "ATLANTA      "
1270 DATA "BALTIMORE    "
1280 DATA "BOSTON       "
1290 DATA "CHICAGO      "
1300 DATA "DALLAS       "
1310 DATA "DENVER       "
1320 DATA "KANSAS CITY  "
1330 DATA "NEW YORK     "
1340 DATA "SAN FRANCISCO"
1350 DATA "SEATTLE      "
1360 REM  E1
1370 DATA 5.,2.272,143.533,67.418,13.403,9.891,9.367
1380 REM L1
1390 DATA 0,28.596,58.978,18.005,16.275,10.485,7.822
1400 REM  M1
1410 DATA 0,36.313,20.731,4.377,9.777,1.827,2.327
1420 REM  S2
1430 DATA 0.,.56358,.60373,.75544,.50817,.24621,.93104
1440 REM  I3
1450 DATA 45,23,19,55
1460 REM  S3
1470 DATA .60528,.57591,.70016,.62
1480 REM TL$
1490 DATA 1.0,1.754084,2.508168,3.262252
1500 REM  START OF MAIN PROGRAM
1510 REM
1520 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1530 PRINT
1540 M1$(0)="RUN CASE, DATA ENTRY COMPLETE"
1550 M1$(1)="YEAR OF NSSS PURCHASE"
1560 M1$(2)="YEAR OF CONSTRUCTION PERMIT"
1570 M1$(3)="YEAR OF COMMERCIAL OPERATION"
1580 M1$(5)="INTEREST RATE"
1590 M1$(6)="ESCALATION RATE"
1600 M1$(7)="CONTINGENCY PERCENTAGE"
1610 M1$(8)="PLANT SIZE (MWE)"
1620 M1$(9)="CITY NUMBER"
```

```
1630 M1$(10)="10 = RESET TO DEFAULT VALUES"
1640 M1$(11)="99 = EXIT PROGRAM"
1650 FOR I=0 TO 9
1660 IF I=4 THEN 1690
1670 PRINT TAB(10) I;"= ";M1$(I);TAB(45) V1(I)
1680 IF I <> 0 THEN 1690
1690 NEXT I
1700 PRINT TAB(10);M1$(10)
1710 PRINT TAB(10);M1$(11)
1720 PRINT
1730 PRINT "      ITEM NUMBER:"
1740 INPUT M4
1750 IF M4=0 THEN 2130
1760 IF M4<=0 THEN 1530
1770 IF M4>= 10 THEN 1790
1780 GOTO 1840
1790 IF M4=10 THEN 1810
1800 GOTO 1830
1810 RESTORE
1820 GOTO 430
1830 IF M4>10 THEN 3220
1840 REM  INPUT NEW VARIABLES
1850 IF M4 <> 9 THEN 1990
1860 PRINT
1870 PRINT TAB(10)"CITY NUMBERS:"
1880 PRINT
1890 FOR I=1 TO 11
1900 PRINT TAB(10) I;TAB(16) T3$(I)
1910 NEXT I
1920 PRINT
1930 PRINT
1940 PRINT "      ENTER NUMBER OF NEW CITY:"
1950 INPUT V1(9)
1960 IF V1(9) < 1 THEN 1860
1970 IF V1(9) > 11 THEN 1860
1980 GOTO 2020
1990 IF M4=4 THEN 2020
2000 PRINT "      ENTER NEW ";M1$(M4)
2010 INPUT V1(M4)
2020 Y1=V1(1)
2030 Y2=V1(2)
2040 Y3=V1(3)
2050 I1=V1(5)
2060 E2=V1(6)
2070 C1=V1(7)
2080 S1=V1(8)
2090 C2=V1(9)
2100 Y4=V1(11)
2110 R1=V1(10)
2120 GOTO 1510
2130 PRINT "      ENTER RUN IDENTIFICATION (OR NULL LINE)"
2140 INPUT R3$
2150 REM PRINT INPUT VALUES
2160 PRINT #1,V$;"  C A P I T A L   C O S T   E S T I M A T E"
```

```
2170 PRINT #1," "
2180 PRINT #1,V3$;"     VERSION 1/8/85"
2190 PRINT #1,V3$;"    RUN DATE ";T4$
2200 PRINT #1,V$
2210 PRINT #1,V$;R3$
2220 PRINT #1,V$;"EEDB PHASE VI, 1/83 REGULATORY STATUS"
2230 PRINT #1,V$;"COAL-FIRED POWER PLANT"
2240 PRINT #1, USING U$(5); Y1
2250 PRINT #1,V$;"YEAR OF CONSTRUCTION PERMIT";TAB(50) Y2
2260 PRINT #1,V$;"YEAR OF COMMERCIAL OPERATION";TAB(50) Y3
2270 PRINT #1,V$;"INTEREST RATE DURING CONST. (percent/year) ";TAB(53)
I1
2280 PRINT #1,V$;"ESCALATION RATE (percent/year)"; TAB(53) E2
2290 PRINT #1,V$;"CONTINGENCY (percent) ",TAB(52) C1
2300 PRINT #1,V$;"NET RATING PER UNIT (MWe): ";TAB(51) S1
2310 PRINT #1, USING U$(13); T3$(C2)
2320 PRINT #1,V$
2330 REM  SCALE DIRECTS
2340 S5=0
2350 S6=0
2360 E4=(1+E2/100) (Y1-Y4)
2370 FOR A1=1 TO 7
2380 C4(A1)=(E1(A1)+L1(A1)+M1(A1))*((S1/B1) S2(A1))*E4
2390 S5=S5+C4(A1)
2400 NEXT A1
2410 FOR A1=1 TO 4
2420 C7(A1)=I3(A1)*((S1/B1) S3(A1))*E4
2430 S6=S6+C7(A1)
2440 NEXT A1
2450 S7=S5+S6
2460 PRINT #1,V$;"DIRECT COSTS ($millions)"
2470 E1=0
2480 L1=0
2490 M1=0
2500 FOR I = 1 TO 7
2510 PRINT #1, USING T1$(I); C4(I)
2520 NEXT I
2530 PRINT #1, USING U$(6); S5
2540 PRINT #1," "
2550 REM SCALE INDIRECTS
2560 PRINT #1,V$;" INDIRECT COSTS"
2570 FOR I = 1 TO 4
2580 PRINT #1, USING T1$(7+I); C7(I)
2590 NEXT I
2600 PRINT #1, USING U$(7); S6
2610 PRINT #1," "
2620 PRINT #1, USING U$(8); S7
2630 REM  CONTINGENCY CALCS.
2640 C5=C1*S7/100
2650 PRINT #1,V$
2660 PRINT #1, USING U$(9); C5
2670 S9=S7+C5
2680 X2=(.13177/.3333)*(Y2-Y1)/(Y3-Y1)
2690 E6=P/(1-X2)
```

```
2700 B3=P/2-E6
2710 N5=Y3-Y1
2720 C9=0
2730 E8=0
2740 E9=0
2750 E=(1+E2/200)/(1+E2/100)
2760 W1=0
2770 FOR C0=1 TO N5
2780 R3=C0
2790 X=R3/N5
2800 IF X >= X2 THEN 2820
2810 X=X2
2820 R=E6*X+B3
2830 Y=.5*SIN(R)+.5
2840 W=S9*Y
2850 E=(1+E2/100)*E
2860 E7=(W-W1)*(E-1)
2870 E9=E8+W1
2880 W1=W
2890 E8=E8+E7
2900 E0=W+E8
2910 A2=(E9+E0)/2+C9
2920 F2=A2*I1/100
2930 C9=C9+F2
2940 W2=E0+C9
2950 L=W2*(M3(C2)-1)
2960 N8=W2+L
2970 FOR U=1 TO 4
2980 N6(U)=N8*M7(U)
2990 D4(U)=N6(U)*1000/(S1*U)
3000 NEXT U
3010 NEXT C0
3020 PRINT #1,V$
3030 PRINT #1, USING U$(10); S9
3040 PRINT #1,V$
3050 PRINT #1, USING U$(11); E8
3060 PRINT #1,V$
3070 PRINT #1, USING U$(4); E0
3080 PRINT #1,V$
3090 PRINT #1, USING U$(3);C9
3100 PRINT #1,V$
3110 PRINT #1, USING U$(2);W2
3120 PRINT #1," "
3130 PRINT #1, USING U$(12); T3$(C2);L
3140 PRINT #1,V$
3150 PRINT #1,V$
3160 FOR I=1 TO 4
3170 PRINT #1, USING U$(1);I;D4(I);N6(I)
3180 NEXT I
3190 PRINT #1, CHR$(12)
3200 GOTO 1510
3210 CLOSE #1
3220 END
```

```
10 REM  WETOM.BAS
20 REM  NONFUEL O&M COST FOR COAL-FIRED POWER PLANT WITH WET LIMESTONE
FGD
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 REM  A      ANNGEN
70 REM  A$     ANSWER
80 REM  A1     ADM
90 REM  A2     ADMGEN
100 REM  A3     ASH
110 REM  B1     BASECF
120 REM  B2     BASEYR
130 REM  B3     BASM
140 REM  B4     BTU
150 REM  C2     COSTAF
160 REM  C4     COSLMS
170 REM  C5     COLIMS
180 REM  C6     CLIMES
190 REM  D      DIRECT
200 REM  D1     DASH
210 REM  D2     DDASH
220 REM  D3     DISPOS
230 REM  E      ETANET
240 REM  E0     ESCGEN
250 REM  E1     ESSLUR
260 REM  E2     ESCPIN
270 REM  E3     ESLIMS
280 REM  E4     ESCSUP
290 REM  E7     ESMATL
300 REM  E8     ESWAGE
310 REM  F2     FIXFAC
320 REM  F3     FIXMIL
330 REM  F4     FIXMNT
340 REM  F5     FIXSE
350 REM  F6     FORTYR
360 REM  F7     FRINGE
370 REM  F8     FULLYR
380 REM  H      HUNDRED
390 REM  H1     HTRATE
400 REM  I1     IESC
410 REM  M      MILLION
420 REM  M1     MWT
430 REM  M2     MWN
440 REM  M3     MANCOS
450 REM  N      NUM
460 REM  O      OVERTHOU
470 REM  P      PLTFAC
480 REM  P4     PROPIN
490 REM  P6     PCTSRM
500 REM  P7     PCTSUL
510 REM  R$     REPLY
520 REM  R3$
530 REM  S      STAFF
540 DIM  S(4)
```

```
550 REM  S0     SLUSUL
560 REM  S1     SUPER
570 REM  S2     SUPEXP
580 REM  S3     STAFF3
590 DIM  S3(4)
600 REM  S4     STAFF4
610 DIM  S4(4)
620 REM  S5     SUPEXF
630 REM  S6     SUPORT
640 REM  S7     SLURY
650 REM  S8     SULREM
660 REM  S9     SLURRY
670 REM  T0     SUL
680 REM  T      THOUSAND
690 REM  T1     TOTAL
700 REM  T2     TOTFIX
710 REM  T3     TOTMIL
720 REM  T4     TOTMNT
730 REM  T5     TOTVAR
740 REM  T6     TONCOL
750 REM  T7     TONSUL
760 REM  T8     TONLMS
770 REM  U      UNITS
780 REM  U$
790 DIM  U$(50)
800 REM  V$     V
810 REM  V1     VARFAC
820 REM  V2     VARMIL
830 REM  V3     VARMNT
840 REM  V4     VSEBAS
850 REM  V5     VSEMIL
860 REM  V6     VARSE
870 REM  W      WAGERT
880 REM  X      XLIMSS
890 REM  Y      YEAR
900 REM  Z$
910 DEF FNI(B2,Y,E8)=(1+E8/100) (Y-B2)
920 PRINT TAB(20) "NONFUEL O&M COST FOR COAL-FIRED POWER PLANT"
930 PRINT TAB(20) "      WITH WET LIMESTONE FGD SYSTEM" : PRINT
940 REM  GET TODAY'S DATE
950 FOR I=1 TO 4
960 PRINT
970 NEXT I
980 PRINT "     ENTER TODAY'S DATE : MO/DA/YR"
990 INPUT D$
1000 U$(1)="     NET RATING OF EACH UNIT (MWe)                    ####."
1010 U$(2)="     NUMBER OF UNITS PER PLANT                           #."
1020 U$(3)="     BASE LOAD CAPACITY FACTOR                         .##"
1030 U$(4)="     ESCALATION RATE (percent/year)                  ##.##"
1040 U$(5)="     THERMAL INPUT PER UNIT (MWt)                     ####."
1050 U$(6)="     SULFUR (percent)                                  ##.#"
1060 U$(7)="     ASH (percent)                                     ##.#"
1070 U$(8)="     HEATING VALUE (BTU/lb)                          #####."
1080 U$(9)="     PLANT NET HEAT RATE (BTU/kWh)                   #####."
```

```
1090 U$(10)="      PLANT NET EFFICIENCY (percent)                    ##.#"
1100 U$(11)="      ANNUAL NET GENERATION (million kWh)               ####."
1110 U$(12)="      YEAR OF ESTIMATE                                  ####."
1120 U$(13)="      STAFF ONSITE                                      ##.##"
1130 U$(14)="      (###. PERSONS AT $$####.)"
1140 U$(15)="      MAINTENANCE MATERIAL                              ##.##"
1150 U$(16)="           FIXED
##.##"
1160 U$(17)="           VARIABLE
##.##"
1170 U$(18)="      SUPPLIES AND EXPENSES                             ##.##"
1180 U$(19)="           VARIABLE - PLANT
##.##"
1190 U$(20)="                    - LIMESTONE
##.##"
1200 U$(21)="                    - ASH, FGD SLUDGE
##.##"
1210 U$(22)="      OFFSITE SUPPORT SERVICES                          ##.##"
1220 U$(23)="      ADMINISTRATIVE AND GENERAL                        ##.##"
1230 U$(24)="           PROPERTY INSURANCE
##.##"
1240 U$(25)="           OTHER A&G
##.##"
1250 U$(26)="      TOTAL FIXED DIRECTS AND INDIRECTS
###.#"
1260 U$(27)="      TOTAL VARIABLE DIRECTS AND INDIRECTS
###.#"
1270 U$(28)="      TOTAL NONFUEL O&M
###.#"
1280 U$(29)="      FIXED DIRECTS AND INDIRECTS
##.##"
1290 U$(30)="      VARIABLE DIRECTS AND INDIRECTS
##.##"
1300 U$(31)="      TOTAL NONFUEL O&M
##.##"
1310 REM  CONSTANTS
1320 V$="      "
1330 D1=5
1340 S7=5
1350 C4=12.5
1360 X=4
1370 P6=90
1380 P7=3.5
1390 S0=4
1400 F6=2080
1410 W=10.45
1420 B1=.8
1430 B2=1982
1440 F2=.62
1450 F6=2080
1460 F7=35
1470 F8=8766
1480 H=100!
1490 M=1000000!
```

```
1500 O=.001
1510 S1=10
1520 S5=2200
1530 T=1000!
1540 V1=.2
1550 V5=.12
1560 Z$="&"
1570 REM  INITO1
1580 FOR I=1 TO 4
1590 READ S(I)
1600 DATA 234,295,368,440
1610 NEXT I
1620 FOR I=1 TO 4
1630 READ S3(I)
1640 DATA 118,158,200,242
1650 NEXT I
1660 FOR I=1 TO 4
1670 READ S4(I)
1680 DATA 19,23,30,36
1690 NEXT I
1700 I1=1
1710 M2=550
1720 U=2
1730 P=.65
1740 H1=9900
1750 Y=1983
1760 REM  INITO2
1770 E8=8
1780 E7=10
1790 E4=10
1800 E1=10
1810 E2=6
1820 E3=10
1830 E0=6
1840 A3=11.6
1850 B4=11000
1860 T0=3.5
1870 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1880 PRINT
1890 PRINT "     0 = RUN CASE, DATA ENTRY COMPLETE"
1900 PRINT "     1 = NET RATING OF EACH UNIT (MWe) ";M2
1910 PRINT "     2 = NUMBER OF UNITS PER PLANT ";U
1920 PRINT "     3 = BASE LOAD CAPACITY FACTOR ";P
1930 PRINT "     4 = YEAR OF OPERATION ";Y
1940 IF I1=1 GOTO 1960
1950 IF I1=2 GOTO 1980
1960 PRINT "     5 = ESCALATION RATES -- VARIOUS"
1970 GOTO 1990
1980 PRINT "     5 = ESCALATION RATE (percent) ";E0
1990 PRINT "     6 = PLANT NET HEAT RATE ";H1
2000 PRINT "     7 = SULFUR (percent) ";T0
2010 PRINT "         ASH (percent) ";A3
2020 PRINT "         HEATING VALUE (BTU/lb) ";B4
```

```
2030 PRINT "     99 = EXIT PROGRAM"
2040 PRINT
2050 PRINT "      ENTER A NUMBER FROM THE MENU"
2060 INPUT N
2070 IF N=0 GOTO 2570
2080 IF N=1 GOTO 2160
2090 IF N=2 GOTO 2190
2100 IF N=3 GOTO 2220
2110 IF N=4 GOTO 2250
2120 IF N=5 GOTO 2280
2130 IF N=6 GOTO 2460
2140 IF N=7 GOTO 2490
2150 IF N > 7 GOTO 3670
2160 PRINT "      INPUT MWE NET RATING PER UNIT"
2170 INPUT M2
2180 GOTO 1870
2190 PRINT "      INPUT NUMBER OF UNITS PER PLANT"
2200 INPUT U
2210 GOTO 1870
2220 PRINT "      INPUT BASE LOAD CAPACITY FACTOR AS A DECIMAL"
2230 INPUT P
2240 GOTO 1870
2250 PRINT "      INPUT YEAR OF OPERATION"
2260 INPUT Y
2270 GOTO 1870
2280 PRINT "      DO YOU WANT TO USE THE DEFAULT GENERAL ESCALATION
RATE?"
2290 PRINT "      (Y OR N)"
2300 INPUT A$
2310 IF A$="Y" GOTO 2340
2320 IF A$="y" GOTO 2340
2330 GOTO 2360
2340 GOSUB 3560
2350 GOTO 2450
2360 PRINT "      DO YOU WANT TO INPUT A GENERAL ESCALATION RATE? (Y OR
N)"
2370 INPUT A$
2380 IF A$="Y" GOTO 2420
2390 IF A$="y" GOTO 2420
2400 I1=1
2410 GOTO 2450
2420 PRINT "      INPUT ESCALATION RATE (percent)"
2430 INPUT E0
2440 GOSUB 3560
2450 GOTO 1870
2460 PRINT "      INPUT PLANT NET HEAT RATE(BTU/kWh)"
2470 INPUT H1
2480 GOTO 1870
2490 PRINT "      INPUT SULFUR (percent)"
2500 INPUT T0
2510 PRINT "      INPUT ASH (percent)"
2520 INPUT A3
2530 PRINT "      INPUT HEATING VALUE (BTU/lb)"
2540 INPUT B4
```

```
2550 GOTO 1870
2560 REM  WRITEIT1
2570 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
2580 INPUT R3$
2590 PRINT #1,"          SUMMARY OF ANNUAL NONFUEL O&M COST FOR COAL-
FIRED"
2600 PRINT #1,"              POWER PLANT WITH WET LIMESTONE FGD SYSTEM"
2610 PRINT #1,V$
2620 PRINT #1,"                          VERSION 1/10/85"
2630 PRINT #1,"                         RUN DATE ";D$
2640 PRINT #1,V$
2650 PRINT #1,V$;R3$
2660 PRINT #1, USING U$(1);M2
2670 PRINT #1, USING U$(2);U
2680 PRINT #1, USING U$(3);P
2690 IF I1=1 GOTO 2710
2700 IF I1=2 GOTO 2730
2710 PRINT #1," INDIVIDUAL ESCALATION RATES USED "
2720 GOTO 2780
2730 PRINT #1, USING U$(4);E0
2740 PRINT #1, USING U$(6);T0
2750 PRINT #1, USING U$(7);A3
2760 PRINT #1, USING U$(8);B4
2770 REM  PRELIM2
2780 E=3412.14*H/H1
2790 M1=M2*H/E
2800 A=M2*F8*P*U/T
2810 PRINT #1, USING U$(5);M1
2820 PRINT #1, USING U$(9);H1
2830 PRINT #1, USING U$(10);E
2840 PRINT #1, USING U$(11);A
2850 PRINT #1, USING U$(12);Y
2860 REM  STAFFING
2870 M3=F6*W*(1+F7/H)*(1+S1/H)*(1+P1/H)*FNI(B2,Y,E8)
2880 C2=S(U)*M3/M
2890 PRINT #1,V$
2900 PRINT #1,"            DIRECT COSTS ($million/year) "
2910 PRINT #1, USING U$(13);C2
2920 PRINT #1, USING U$(14);S(U);M3
2930 REM  MAINT
2940 B3=S3(U)*(M3/M)*((H+E7)/(H+E8))  (Y-B2)
2950 F4=F2*B3
2960 V3=V1*B3*P/B1
2970 T4=F4+V3
2980 PRINT #1,V$
2990 PRINT #1, USING U$(15);T4
3000 PRINT #1, USING U$(16);F4
3010 PRINT #1, USING U$(17);V3
3020 REM  SUPPLIES
3030 V4=V5*(A/T)*FNI(B2,Y,E4)
3040 T6=A*H1*M/(B4*2000)
3050 D2=D1*FNI(B2,Y,E1)
3060 T7=T6*P7/H
3070 S8=T7*P6/H
```

```
3080 S9=S7*FNI(B2,Y,E1)
3090 T8=S8*X
3100 C5=C4*FNI(B2,Y,E3)
3110 C6=T8*C5/M
3120 D3=S8*S0*S9/M+T6*A3*D2/(M*H)
3130 F5=O*S5*U*FNI(B2,Y,E4)
3140 V6=V4+C6+D3
3150 S2=F5+V6
3160 PRINT #1,V$
3170 PRINT #1, USING U$(18);S2
3180 PRINT #1, USING U$(16);F5
3190 PRINT #1, USING U$(19);V4
3200 PRINT #1, USING U$(20);C6
3210 PRINT #1, USING U$(21);D3
3220 REM  OFFSITE
3230 S6=S4(U)*M3*1.5/M
3240 PRINT #1,V$
3250 PRINT #1, USING U$(22);S6
3260 REM  ADMINGEN
3270 P4=O*U*H*FNI(B2,Y,E2)
3280 D=C2+T4+S2+S6
3290 A1=10*D/H
3300 A2=P4+A1
3310 REM  ADMINOUT
3320 PRINT #1,V$
3330 PRINT #1,"              INDIRECT COSTS ($million/year)"
3340 PRINT #1, USING U$(23);A2
3350 PRINT #1, USING U$(24);P4
3360 PRINT #1, USING U$(25);Z$;A1
3370 REM  FINAL
3380 T2=C2+F4+F1+A2+F5+S6
3390 T5=V3+V6
3400 T1=T2+T5
3410 F3=T*T2/A
3420 V2=T*T5/A
3430 T3=T*T1/A
3440 PRINT #1,V$
3450 PRINT #1,"              COSTS ($million/year)"
3460 PRINT #1, USING U$(26);T2
3470 PRINT #1, USING U$(27);T5
3480 PRINT #1, USING U$(28);Z$;T1
3490 PRINT #1,V$
3500 PRINT #1,"              UNIT COSTS (mills/kWh)"
3510 PRINT #1, USING U$(29);F3
3520 PRINT #1, USING U$(30);V2
3530 PRINT #1, USING U$(31);Z$;T3
3540 PRINT #1, CHR$(12)
3550 GOTO 3650
3560 REM  REDOESC
3570 I1=2
3580 E8=E0
3590 E7=E0
3600 E4=E0
3610 E1=E0
```

```
3620 E2=E0
3630 E3=E0
3640 RETURN
3650 PRINT
3660 GOTO 1870
3670 CLOSE #1
3680 END
```

```
10 REM  COALCO.BAS
20 REM  LEVELIZED COAL COST
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 REM  V                V$
70 REM                   D$        DATE
80 REM  DOLLARMBTU       D0
90 REM  F0               F0
100 REM  GNPINFLATRATE   G0
110 REM  HTRATE          H0
120 REM  ILIFE           I1
130 REM  NUM             N1
140 REM  OVERALLESCRATE  O0
150 REM  PLANTLIFE       P1
160 REM  POFBAR          P0
170 REM  RUN IDENT.      R$
180 REM  REALESCRATE     R1
190 REM  REFYEAR         R0
200 REM  TAWACM          T0
210 REM                  U$
220 DIM U$(20)
230 REM  YEARSTART       Y0
240 REM  YEARSTOREF      Y1
250 U$(1)="     1 = REFERENCE YEAR FOR PRICE OF COAL              ####."
260 U$(2)="     2 = PRICE OF COAL IN DOLLARS PER MILLION BTU     ##.##"
270 U$(3)="     3 = YEAR OF STARTUP                               ####."
280 U$(4)="     4 = PLANT LIFE                                      ##."
290 U$(5)="     5 = GNP INFLATION RATE                           #.###"
300 U$(6)="     6 = REAL COST ESCALATION RATE                    #.###"
310 U$(7)="     7 = PLANT NET HEAT RATE (BTU/kWh)                #####."
320 U$(8)="     8 = EFFECTIVE COST OF MONEY                      #.###"
330 DEF FNA(I,N)=((1+I) N-1)/(I*(1+I) N)
340 DEF FNB(I,N)=1/FNA(I,N)
350 DEF FND(X,J)=(X-J)/(1+J)
360 DEF
FNC(R,I,X,Y,I1)=(FNB((FND(X,I)),I1)/FNB((FND(X,R)),I1))*((1+R)/(1+I)) Y
370 REM  GET TODAY'S DATE
380 FOR I=1 TO 5
390 PRINT
400 NEXT I
410 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
420 INPUT D$
430 V$="      "
440 R0=1983
450 D0=1.6
460 Y0=1995
470 P1=30
480 H0=9900
490 T0=9.000001E-02
500 G0=.06
510 R1=.015
520 Y1=12
530 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS TIME
ARE:"
```

```
540 PRINT
550 PRINT "      0 = RUN CASE, DATA ENTRY COMPLETE"
560 PRINT USING U$(1);R0
570 PRINT USING U$(2);D0
580 PRINT USING U$(3);Y0
590 PRINT USING U$(4);P1
600 PRINT USING U$(5);G0
610 PRINT USING U$(6);R1
620 PRINT USING U$(7);H0
630 PRINT USING U$(8);T0
640 PRINT "     99 = EXIT PROGRAM"
650 PRINT V$
660 PRINT "      ENTER A NUMBER FROM THE MENU"
670 INPUT N1
680 IF N1=0 GOTO 1060
690 IF N1=1 GOTO 790
700 IF N1=2 GOTO 830
710 IF N1=3 GOTO 860
720 IF N1=4 GOTO 900
730 IF N1=5 GOTO 930
740 IF N1=6 GOTO 960
750 IF N1=7 GOTO 990
760 IF N1=8 GOTO 1020
770 IF N1 > 8 GOTO 1500
780 IF N1 < 0 GOTO 1050
790 PRINT "      INPUT REFERENCE YEAR FOR PRICE OF COAL"
800 INPUT R0
810 Y1=Y0-R0
820 GOTO 530
830 PRINT "      INPUT PRICE OF COAL IN REFERENCE YEAR DOLLARS PER
MILLION BTU"
840 INPUT D0
850 GOTO 530
860 PRINT "      INPUT CONSTANT DOLLAR LEVELIZED COST YEAR"
870 INPUT Y0
880 Y1=Y0-R0
890 GOTO 530
900 PRINT "      INPUT PLANT LIFE (years)"
910 INPUT P1
920 GOTO 530
930 PRINT "      INPUT GNP INFLATION RATE (decimal)"
940 INPUT G0
950 GOTO 530
960 PRINT "      INPUT REAL ESCALATION RATE (decimal)"
970 INPUT R1
980 GOTO 530
990 PRINT "      INPUT PLANT NET HEAT RATE (BTU/kWh)"
1000 INPUT H0
1010 GOTO 530
1020 PRINT "      INPUT EFFECTIVE COST OF MONEY (decimal)"
1030 INPUT T0
1040 GOTO 530
1050 GOTO 1510
1060 PRINT
```

```
1070 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
1080 INPUT R$
1090 PRINT #1,"     L E V E L I Z E D   C O A L   C O S T"
1100 PRINT #1,V$
1110 PRINT #1,"                    VERSION 1/10/85"
1120 PRINT #1,"                   RUN DATE ";D$
1130 PRINT #1,V$
1140 PRINT #1,"     INPUT DATA"
1150 PRINT #1,"     ___________"
1160 PRINT #1,V$
1170 PRINT #1,V$;R$
1180 C$="     REFERENCE YEAR FOR PRICE OF COAL                ####"
1190 PRINT #1, USING C$;RO
1200 A$="     PRICE OF COAL IN DOLLARS PER MILLION BTU        ##.#"
1210 PRINT #1, USING A$;DO
1220 B$="     YEAR OF PLANT STARTUP                           ####"
1230 PRINT #1, USING B$;YO
1240 E$="     PLANT LIFE                                        ##"
1250 PRINT #1, USING E$;P1
1260 F$="     GNP INFLATION RATE                             #.###"
1270 PRINT #1, USING F$;GO
1280 G$="     REAL COST ESCALATION RATE                      #.###"
1290 PRINT #1, USING G$;R1
1300 H$="     EFFECTIVE COST OF MONEY                        #.###"
1310 PRINT #1, USING H$;TO
1320 I$="     PLANT NET HEAT RATE (Btu/kWh)                  #####"
1330 PRINT #1, USING I$;HO
1340 PRINT #1,V$
1350 M$="     ____________________________________________________________"
1360 PRINT #1,M$
1370 FO=DO*HO*.000001*1000!
1380 I1=P1
1390 OO=(1+R1)*(1+GO)-1
1400 PO=FO*FNC(OO,GO,TO,Y1,I1)
1410 PRINT #1,V$
1420 J$="     CONSTANT DOLLAR LEVELIZED COST OF COAL IN #### DOLLARS"
1430 PRINT #1, USING J$;RO
1440 K$="                                              ##.# mills/kWh"
1450 PRINT #1, USING K$;PO
1460 PRINT #1,V$
1470 PRINT #1,M$
1480 PRINT #1, CHR$(12)
1490 GOTO 530
1500 CLOSE #1
1510 END
```

```
10 REM  CAPCOS.BAS
20 REM  CAPITAL INVESTMENT COST
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 DIM N6(4)
70 DIM T3$(11)
80 DIM V1(15)
90 DIM E1(7)
100 DIM L1(7)
110 DIM M1(7)
120 DIM S2(7)
130 DIM I3(4)
140 DIM S3(4)
150 DIM M1$(31)
160 DIM M3(12)
170 DIM D4(7)
180 DIM U$(50)
190 PRINT TAB(20) "POWER PLANT CAPITAL COSTS"
200 PRINT
210 REM  GET TODAYS DATE
220 FOR I=1 TO 4
230 PRINT
240 NEXT I
250 PRINT "     ENTER TODAY'S DATE: MO/DA/YR"
260 INPUT T4$
270 PRINT
280 PRINT
290 REM  SET DEFAULT VALUES
300 FOR I=1 TO 11
310 READ T3$(I)
320 NEXT I
330 V$="     "
340 V2$="          "
350 V3$="               "
360 P=3.14159
370 B1=1100
380 Y4=1983
390 R2=2738/2722
400 R1=0
410 Y1=1987
420 V1(1)=Y1
430 Y2=1989
440 V1(2)=Y2
450 Y3=1995
460 V1(3)=Y3
470 I1=9
480 V1(4)=I1
490 E2=7
500 V1(5)=E2
510 C1=10
520 V1(6)=C1
530 S1=1100
540 V1(7)=S1
550 C2=5
```

```
560 V1(8)=C2
570 Y4=1987
580 V1(9)=Y4
590 B1=1100
600 V1(10)=B1
610 S5=1036
620 V1(11)=S5
630 S6=649
640 V1(12)=S6
650 T2$="N"
660 DEF FNA(X,Y)=X Y
670 IF T2$="N" THEN 710
680 IF T2$="n" THEN 710
690 IF T2$="C" THEN 930
700 IF T2$="c" THEN 930
710 REM  NUCLEAR
720 A$="      PLANT TYPE                                    NUCLEAR"
730 T2=1
740 S2=.583561
750 S3=.346719
760 R2=2738/2722
770 M7(1)=1
780 M7(2)=1.719512
790 M7(3)=2.449502
800 M7(4)=3.179491
810 M3(1)=1
820 M3(2)=.9/R2
830 M3(3)=.95/R2
840 M3(4)=1!/R2
850 M3(5)=1!/R2
860 M3(6)=.94/R2
870 M3(7)=.96/R2
880 M3(8)=.96/R2
890 M3(9)=1.04/R2
900 M3(10)=1.07/R2
910 M3(11)=1.03/R2
920 GOTO 1140
930 REM  COAL-FIRED
940 A$="      PLANT TYPE                                COAL-FIRED"
950 T2=2
960 S2=.62141
970 S3=.62141
980 R2=2738/2722
990 M7(1)=1
1000 M7(2)=1.754084
1010 M7(3)=2.508168
1020 M7(4)=3.262252
1030 M3(1)=1
1040 M3(2)=.9/R2
1050 M3(3)=.95/R2
1060 M3(4)=1!/R2
1070 M3(5)=1!/R2
1080 M3(6)=.94/R2
1090 M3(7)=.96/R2
```

```
1100 M3(8)=.96/R2
1110 M3(9)=1.04/R2
1120 M3(10)=1.07/R2
1130 M3(11)=1.03/R2
1140 REM  END MARKER
1150 REM T3$
1160 DATA "MIDDLETOWN    "
1170 DATA "ATLANTA       "
1180 DATA "BALTIMORE     "
1190 DATA "BOSTON        "
1200 DATA "CHICAGO       "
1210 DATA "DALLAS        "
1220 DATA "DENVER        "
1230 DATA "KANSAS CITY   "
1240 DATA "NEW YORK      "
1250 DATA "SAN FRANCISCO"
1260 DATA "SEATTLE       "
1270 U$(1)="     YEAR OF STEAM SUPPLY SYSTEM PURCHASE          ####."
1280 U$(2)="     YEAR OF CONSTRUCTION PERMIT                   ####."
1290 U$(3)="     YEAR OF COMMERCIAL OPERATION                  ####."
1300 U$(4)="     INTEREST RATE DURING CONST. (percent/year)      ##."
1310 U$(5)="     ESCALATION RATE (percent/year)                  ##."
1320 U$(6)="     CONTINGENCY (percent)                           ##."
1330 U$(7)="     NET RATING PER UNIT (MWe)                     ####."
1340 U$(8)="     PLANT LOCATION                          &"
1350 U$(9)="     BASE YEAR FOR DIRECT AND INDIRECT COST INPUT ####."
1360 U$(10)="     BASE SIZE FOR DIRECT AND INDIRECT COST INPUT ####."
1370 U$(11)="     DIRECT COST AT BASE SIZE/YEAR ($millions)   #####."
1380 U$(12)="     INDIRECT COST AT BASE SIZE/YEAR ($millions) #####."
1390 U$(13)="          DIRECT COSTS                           #####."
1400 U$(14)="          INDIRECT COSTS                         #####."
1410 U$(15)="          SUBTOTAL DIRECT AND INDIRECT COSTS     #####."
1420 U$(16)="          CONTINGENCY ALLOWANCE                  #####."
1430 U$(17)="          TOTAL DIR. AND INDIR. COST BEFORE ESC. #####."
1440 U$(18)="     ESCALATION DURING CONSTRUCTION              #####."
1450 U$(19)="     TOTAL ESCALATED DIRECT AND INDIRECT COSTS   #####."
1460 U$(20)="     TOTAL INTEREST DURING CONSTRUCTION          #####."
1470 U$(21)="     TOTAL PLANT CAPITAL INVESTMENT &#####."
1480 U$(22)="     PLANT LOCATION ADJUSTMENT &     #####."
1490 U$(23)="     # UNIT PLANT CAPITAL INVESTMENT (####. $/kWe) #####."
1500 REM  START OF MAIN PROGRAM
1510 REM============START OF MENU PRINTOUT============
1520 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1530 PRINT
1540 REM
1550 REM  MENU ITEM STRINGS
1560 M1$(0)="RUN CASE, DATA ENTRY COMPLETE"
1570 M1$(1)="YEAR OF STEAM SUPPLY SYSTEM PURCHASE"
1580 M1$(2)="YEAR OF CONSTRUCTION PERMIT"
1590 M1$(3)="YEAR OF COMMERCIAL OPERATION"
1600 M1$(4)="INTEREST RATE"
1610 M1$(5)="ESCALATION RATE"
1620 M1$(6)="CONTINGENCY PERCENTAGE"
```

```
1630 M1$(7)="PLANT SIZE (MWe)"
1640 M1$(8)="CITY NUMBER"
1650 M1$(9)="BASE YEAR FOR DIRECT AND INDIRECT COST INPUT"
1660 M1$(10)="BASE SIZE FOR DIRECT AND INDIRECT COST INPUT"
1670 M1$(11)="DIRECT COSTS AT BASE SIZE & YEAR ($millions)"
1680 M1$(12)="INDIRECT COSTS AT BASE SIZE & YEAR ($millions)"
1690 M1$(13)="PLANT TYPE "
1700 M1$(14)="RESET TO DEFAULT VALUES"
1710 M1$(15)="EXIT PROGRAM"
1720 FOR I=0 TO 15
1730 IF I=0 THEN 1790
1740 IF I=13 THEN 1810
1750 IF I=14 THEN 1790
1760 IF I=15 THEN 1790
1770 PRINT TAB(10) I;"  ";M1$(I);TAB(65) V1(I)
1780 GOTO 1920
1790 PRINT TAB(10) I;"  ";M1$(I)
1800 GOTO 1920
1810 IF T2$="N" THEN 1850
1820 IF T2$="n" THEN 1850
1830 IF T2$="C" THEN 1890
1840 IF T2$="c" THEN 1890
1850 REM  NUCLEAR
1860 PRINT TAB(10) I;"  ";M1$(I); "PWR"
1870 T2=1
1880 GOTO 1920
1890 REM  COAL-FIRED
1900 PRINT TAB(10) I;"  ";M1$(I); "COAL-FIRED"
1910 T2=2
1920 NEXT I
1930 REM==============END OF MENU PRINTOUT================
1940 PRINT
1950 PRINT "     ITEM NUMBER"
1960 INPUT M4
1970 IF M4=0 THEN 2480
1980 IF M4=14 THEN 2010
1990 IF M4 > 14 THEN 3550
2000 GOTO 2030
2010 RESTORE
2020 GOTO 270
2030 REM  INPUT NEW VARIABLES
2040 IF M4=13 THEN 2060
2050 GOTO 2160
2060 PRINT "     INPUT PLANT TYPE N (NUCLEAR) OR C (COAL-FIRED)"
2070 INPUT T2$
2080 IF T2$="N" THEN 2120
2090 IF T2$="n" THEN 2120
2100 IF T2$="C" THEN 2140
2110 IF T2$="c" THEN 2140
2120 T2=1
2130 GOTO 2340
2140 T2=2
2150 GOTO 2340
2160 IF M4 <> 8 THEN 2310
```

```
2170 PRINT
2180 PRINT "     CITY NUMBERS"
2190 PRINT
2200 FOR I=1 TO 11
2210 PRINT TAB(10) I;TAB(16) T3$(I)
2220 NEXT I
2230 PRINT
2240 PRINT
2250 PRINT "     ENTER NUMBER OF NEW CITY"
2260 INPUT V1(8)
2270 IF V1(8) < 1 THEN 2170
2280 IF V1(8) > 11 THEN 2170
2290 GOTO 2350
2300 IF M4=13 THEN 2330
2310 PRINT "     ENTER NEW ";M1$(M4)
2320 INPUT V1(M4)
2330 IF V1(M4)<>0 THEN 2340
2340 REM
2350 Y1=V1(1)
2360 Y2=V1(2)
2370 Y3=V1(3)
2380 I1=V1(4)
2390 E2=V1(5)
2400 C1=V1(6)
2410 S1=V1(7)
2420 C2=V1(8)
2430 Y4=V1(9)
2440 B1=V1(10)
2450 S5=V1(11)
2460 S6=V1(12)
2470 GOTO 670
2480 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
2490 INPUT R3$
2500 REM PRINT INPUT VALUES
2510 PRINT #1,V3$;" C A P I T A L   C O S T   E S T I M A T E"
2520 PRINT #1," "
2530 PRINT #1,V3$;"              VERSION 1/10/85"
2540 PRINT #1,V3$;"             RUN DATE ";T4$
2550 PRINT #1,V$
2560 PRINT #1,V$;R3$
2570 PRINT #1,V$;"EEDB PHASE VI, 1/83 REGULATORY STATUS"
2580 PRINT #1,A$
2590 PRINT #1, USING U$(1); Y1
2600 PRINT #1, USING U$(2); Y2
2610 PRINT #1, USING U$(3); Y3
2620 PRINT #1, USING U$(4); I1
2630 PRINT #1, USING U$(5); E2
2640 PRINT #1, USING U$(6); C1
2650 PRINT #1, USING U$(7); S1
2660 PRINT #1, USING U$(8); T3$(C2)
2670 PRINT #1, USING U$(9); V1(9)
2680 PRINT #1, USING U$(10); V1(10)
2690 PRINT #1, USING U$(11); V1(11)
2700 PRINT #1, USING U$(12); V1(12)
```

```
2710 PRINT #1," "
2720 E4=FNA((1+E2/100),(Y1-Y4))
2730 IF T2=1 THEN 2750
2740 IF T2=2 THEN 2780
2750 S2=.583561
2760 S3=.346719
2770 GOTO 2800
2780 S2=.62141
2790 S3=.62141
2800 O1=S5*FNA(S1/B1,S2)*E4
2810 O2=S6*FNA(S1/B1,S3)*E4
2820 S7=O1+O2
2830 PRINT #1," "
2840 PRINT #1,"     OVERNIGHT COSTS (year SSS purchase, $millions)
2850 PRINT #1, USING U$(13); O1
2860 PRINT #1," "
2870 REM SCALE INDIRECTS
2880 PRINT #1, USING U$(14); O2
2890 PRINT #1," "
2900 PRINT #1, USING U$(15); S7
2910 PRINT #1," "
2920 REM  CONTINGENCY CALCS.
2930 C5=C1*S7/100
2940 PRINT #1, USING U$(16); C5
2950 S9=S7+C5
2960 IF T2$="N" THEN 3000
2970 IF T2$="n" THEN 3000
2980 IF T2$="C" THEN 3020
2990 IF T2$="c" THEN 3020
3000 X2=(.095/.3333)*(Y2-Y1)/(Y3-Y1)
3010 GOTO 3030
3020 X2=(.13177/.3333)*(Y2-Y1)/(Y3-Y1)
3030 REM
3040 E6=P/(1-X2)
3050 B3=P/2-E6
3060 N5=Y3-Y1
3070 C9=0
3080 E8=0
3090 E9=0
3100 E=(1+E2/200)/(1+E2/100)
3110 W1=0
3120 FOR C0=1 TO N5
3130 R3=C0
3140 X=R3/N5
3150 IF X >= X2 THEN 3170
3160 X=X2
3170 R=E6*X+B3
3180 Y=.5*SIN(R)+.5
3190 W=S9*Y
3200 E=(1+E2/100)*E
3210 E7=(W-W1)*(E-1)
3220 E9=E8+W1
3230 W1=W
3240 E8=E8+E7
```

```
3250 E0=W+E8
3260 A2=(E9+E0)/2+C9
3270 F2=A2*I1/100
3280 C9=C9+F2
3290 W2=E0+C9
3300 L=W2*(M3(C2)-1)
3310 N8=W2+L
3320 FOR U=1 TO 4
3330 N6(U)=N8*M7(U)
3340 D4(U)=N6(U)*1000/(S1*U)
3350 NEXT U
3360 NEXT C0
3370 PRINT #1," "
3380 PRINT #1, USING U$(17); S9
3390 PRINT #1," "
3400 PRINT #1, USING U$(18); E8
3410 PRINT #1," "
3420 PRINT #1, USING U$(19); E0
3430 PRINT #1," "
3440 PRINT #1, USING U$(20); C9
3450 PRINT #1," "
3460 PRINT #1, USING U$(21); T3$(1); W2
3470 PRINT #1," "
3480 PRINT #1, USING U$(22);T3$(C2); L
3490 PRINT #1," "
3500 FOR I=1 TO 4
3510 PRINT #1, USING U$(23);I ; D4(I);N6(I)
3520 NEXT I
3530 PRINT #1, CHR$(12)
3540 GOTO 1510
3550 CLOSE #1
3560 END
```

```
10 REM  DRYOM.BAS
20 REM  NONFUEL O&M COST FOR COAL-FIRED POWER PLANT WITH DRY FGD
40 WIDTH "LPT1:",80
50 OPEN "LPT1:" FOR OUTPUT AS #1
60 REM  A      ANNGEN
70 REM  A$     ANSWER
80 REM  A1     ADM
90 REM  A2     ADMGEN
100 REM  A3     ASH
110 REM  B1     BASECF
120 REM  B2     BASEYR
130 REM  B3     BASM
140 REM  B4     BTU
150 REM  C2     COSTAF
160 REM  C4     COSLM
170 REM  C5     COLIMS
180 REM  C6     CLIMES
190 REM  D      DIRECT
200 REM  D1     DASH
210 REM  D2     DDASH
220 REM  D3     DISPOS
230 REM  E      ETANET
240 REM  E0     ESCGEN
250 REM  E1     ESSLUR
260 REM  E2     ESCPIN
270 REM  E3     ESLIM
280 REM  E4     ESCSUP
290 REM  E7     ESMATL
300 REM  E8     ESWAGE
310 REM  F2     FIXFAC
320 REM  F3     FIXMIL
330 REM  F4     FIXMNT
340 REM  F5     FIXSE
350 REM  F6     FORTYR
360 REM  F7     FRINGE
370 REM  F8     FULLYR
380 REM  H      HUNDRED
390 REM  H1     HTRATE
400 REM  I1     IESC
410 REM  M      MILLION
420 REM  M1     MWT
430 REM  M2     MWN
440 REM  M3     MANCOS
450 REM  N      NUM
460 REM  O      OVERTHOU
470 REM  P      PLTFAC
480 REM  P4     PROPIN
490 REM  P6     PCTSRM
500 REM  P7     PCTSUL
510 REM  R$     REPLY
520 REM  R3$
530 REM  S      STAFF
540 DIM  S(4)
550 REM  S0     SLUSUL
```

```
560 REM  S1     SUPER
570 REM  S2     SUPEXP
580 REM  S3     STAFF3
590 DIM  S3(4)
600 REM  S4     STAFF4
610 DIM  S4(4)
620 REM  S5     SUPEXF
630 REM  S6     SUPORT
640 REM  S7     SLURY
650 REM  S8     SULREM
660 REM  S9     SLURRY
670 REM  T0     SUL
680 REM  T      THOUSAND
690 REM  T1     TOTAL
700 REM  T2     TOTFIX
710 REM  T3     TOTMIL
720 REM  T4     TOTMNT
730 REM  T5     TOTVAR
740 REM  T6     TONCOL
750 REM  T7     TONSUL
760 REM  T8     TONLMS
770 REM  U      UNITS
780 REM  U$
790 DIM  U$(50)
800 REM  V$     V
810 REM  V1     VARFAC
820 REM  V2     VARMIL
830 REM  V3     VARMNT
840 REM  V4     VSEBAS
850 REM  V5     VSEMIL
860 REM  V6     VARSE
870 REM  W      WAGERT
880 REM  X      XLIMS
890 REM  Y      YEAR
900 REM  Z$
910 DEF FNI(B2,Y,E8)=(1+E8/100) (Y-B2)
920 PRINT TAB(20) "NONFUEL O&M COST FOR COAL FIRED POWER PLANT"
930 PRINT TAB(20) "          WITH DRY FGD SYSTEM" :PRINT
940 REM  GET TODAY'S DATE
950 FOR I=1 TO 4
960 PRINT
970 NEXT I
980 PRINT "     ENTER TODAY'S DATE : MO/DA/YR"
990 INPUT D$
1000 U$(1)="     NET RATING OF EACH UNIT (MWe)                    ####."
1010 U$(2)="     NUMBER OF UNITS PER PLANT                          #."
1020 U$(3)="     BASE LOAD CAPACITY FACTOR                        .##"
1030 U$(4)="     ESCALATION RATE (percent/year)                  ##.##"
1040 U$(5)="     THERMAL INPUT PER UNIT (MWt)                     ####."
1050 U$(6)="     SULFUR (percent)                                 ##.#"
1060 U$(7)="     ASH (percent)                                    ##.#"
1070 U$(8)="     HEATING VALUE (BTU/lb)                          #####."
1080 U$(9)="     PLANT NET HEAT RATE (BTU/kWh)                   #####."
1090 U$(10)="     PLANT NET EFFICIENCY (percent)                   ##.#"
```

```
1100 U$(11)="      ANNUAL NET GENERATION (million kWh)            ####."
1110 U$(12)="      YEAR OF ESTIMATE                               ####."
1120 U$(13)="      STAFF ONSITE                                   ##.##"
1130 U$(14)="      (###. PERSONS AT $$####.)"
1140 U$(15)="      MAINTENANCE MATERIAL                           ##.##"
1150 U$(16)="           FIXED
##.##"
1160 U$(17)="           VARIABLE
##.##"
1170 U$(18)="      SUPPLIES AND EXPENSES                          ##.##"
1180 U$(19)="           VARIABLE - PLANT
##.##"
1190 U$(20)="                    - LIME
##.##"
1200 U$(21)="                    - ASH, FGD SLUDGE
##.##"
1210 U$(22)="      OFFSITE SUPPORT SERVICES                       ##.##"
1220 U$(23)="      ADMINISTRATIVE AND GENERAL                     ##.##"
1230 U$(24)="           PROPERTY INSURANCE
##.##"
1240 U$(25)="           OTHER A&G
##.##"
1250 U$(26)="      TOTAL FIXED DIRECTS AND INDIRECTS
###.#"
1260 U$(27)="      TOTAL VARIABLE DIRECTS AND INDIRECTS
###.#"
1270 U$(28)="      TOTAL NONFUEL O&M
###.#"
1280 U$(29)="      FIXED DIRECTS AND INDIRECTS
##.##"
1290 U$(30)="      VARIABLE DIRECTS AND INDIRECTS
##.##"
1300 U$(31)="      TOTAL NONFUEL O&M
##.##"
1310 REM  CONSTANTS
1320 V$="      "
1330 D1=5
1340 S7=5
1350 C4=70
1360 X=1
1370 P6=70
1380 P7=.5
1390 S0=4
1400 F6=2080
1410 W=10.45
1420 Z$="&"
1430 B1=.8
1440 B2=1982
1450 F2=.55
1460 F7=35
1470 F8=8766
1480 H=100!
1490 M=1000000!
1500 O=.001
```

```
1510 S1=10
1520 S5=2200
1530 T=1000!
1540 V1=.18
1550 V5=.12
1560 Z$="&"
1570 REM  INIT01
1580 FOR I=1 TO 4
1590 READ S(I)
1600 DATA 216,269,334,398
1610 NEXT I
1620 FOR I=1 TO 4
1630 READ S3(I)
1640 DATA 105,142,181,220
1650 NEXT I
1660 FOR I=1 TO 4
1670 READ S4(I)
1680 DATA 19,23,30,36
1690 NEXT I
1700 I1=1
1710 M2=550
1720 U=2
1730 P=.65
1740 H1=9780
1750 Y=1983
1760 REM  INIT02
1770 E8=8
1780 E7=10
1790 E4=10
1800 E1=10
1810 E2=6
1820 E3=10
1830 E0=6
1840 A3=7.3
1850 B4=8200
1860 T0=.5
1870 PRINT "     THE AVAILABLE MENU OPTIONS AND THEIR VALUES AT THIS
TIME ARE:"
1880 PRINT
1890 PRINT "     0 = RUN CASE, DATA ENTRY COMPLETE"
1900 PRINT "     1 = NET RATING OF EACH UNIT (MWe) ";M2
1910 PRINT "     2 = NUMBER OF UNITS PER PLANT ";U
1920 PRINT "     3 = BASE LOAD CAPACITY FACTOR ";P
1930 PRINT "     4 = YEAR OF OPERATION ";Y
1940 IF I1=1 GOTO 1960
1950 IF I1=2 GOTO 1980
1960 PRINT "     5 = ESCALATION RATES -- VARIOUS"
1970 GOTO 1990
1980 PRINT "     5 = ESCALATION RATE (percent) ";E0
1990 PRINT "     6 = PLANT NET HEAT RATE ";H1
2000 PRINT "     7 = SULFUR (percent) ";T0
2010 PRINT "         ASH (percent) ";A3
2020 PRINT "         HEATING VALUE (BTU/lb) ";B4
2030 PRINT "    99 = EXIT PROGRAM"
```

```
2040 PRINT
2050 PRINT "     ENTER A NUMBER FROM THE MENU"
2060 INPUT N
2070 IF N=0 GOTO 2570
2080 IF N=1 GOTO 2160
2090 IF N=2 GOTO 2190
2100 IF N=3 GOTO 2220
2110 IF N=4 GOTO 2250
2120 IF N=5 GOTO 2280
2130 IF N=6 GOTO 2460
2140 IF N=7 GOTO 2490
2150 IF N > 7 GOTO 3670
2160 PRINT "     INPUT MWE NET RATING PER UNIT"
2170 INPUT M2
2180 GOTO 1870
2190 PRINT "     INPUT NUMBER OF UNITS PER PLANT"
2200 INPUT U
2210 GOTO 1870
2220 PRINT "     INPUT BASE LOAD CAPACITY FACTOR AS A DECIMAL"
2230 INPUT P
2240 GOTO 1870
2250 PRINT "     INPUT YEAR OF OPERATION"
2260 INPUT Y
2270 GOTO 1870
2280 PRINT "     DO YOU WANT TO USE THE DEFAULT GENERAL ESCALATION
RATE?"
2290 PRINT "     (Y OR N)"
2300 INPUT A$
2310 IF A$="Y" GOTO 2340
2320 IF A$="y" GOTO 2340
2330 GOTO 2360
2340 GOSUB 3560
2350 GOTO 2450
2360 PRINT "     DO YOU WANT TO INPUT A GENERAL ESCALATION RATE? (Y OR
N)"
2370 INPUT A$
2380 IF A$="Y" GOTO 2420
2390 IF A$="y" GOTO 2420
2400 I1=1
2410 GOTO 2450
2420 PRINT "     INPUT ESCALATION RATE (percent)"
2430 INPUT E0
2440 GOSUB 3560
2450 GOTO 1870
2460 PRINT "     INPUT PLANT NET HEAT RATE(BTU/kWh)"
2470 INPUT H1
2480 GOTO 1870
2490 PRINT "     INPUT SULFUR (percent)"
2500 INPUT T0
2510 PRINT "     INPUT ASH (percent)"
2520 INPUT A3
2530 PRINT "     INPUT HEATING VALUE (BTU/lb)"
2540 INPUT B4
2550 GOTO 1870
```

```
2560 REM  WRITEIT1
2570 PRINT "     ENTER RUN IDENTIFICATION (OR NULL LINE)"
2580 INPUT R3$
2590 PRINT #1,"          SUMMARY OF ANNUAL NONFUEL O&M COST FOR COAL-
FIRED"
2600 PRINT #1,"              POWER PLANT WITH DRY FGD SYSTEM"
2610 PRINT #1,V$
2620 PRINT #1,"                     VERSION 1/10/85"
2630 PRINT #1,"                    RUN DATE ";D$
2640 PRINT #1,V$
2650 PRINT #1,V$;R3$
2660 PRINT #1, USING U$(1);M2
2670 PRINT #1, USING U$(2);U
2680 PRINT #1, USING U$(3);P
2690 IF I1=1 GOTO 2710
2700 IF I1=2 GOTO 2730
2710 PRINT #1,"     INDIVIDUAL ESCALATION RATES USED "
2720 GOTO 2780
2730 PRINT #1, USING U$(4);E0
2740 PRINT #1, USING U$(6);T0
2750 PRINT #1, USING U$(7);A3
2760 PRINT #1, USING U$(8);B4
2770 REM  PRELIM2
2780 E=3412.14*H/H1
2790 M1=M2*H/E
2800 A=M2*F8*P*U/T
2810 PRINT #1, USING U$(5);M1
2820 PRINT #1, USING U$(9);H1
2830 PRINT #1, USING U$(10);E
2840 PRINT #1, USING U$(11);A
2850 PRINT #1, USING U$(12);Y
2860 REM  STAFFING
2870 M3=F6*W*(1+F7/H)*(1+S1/H)*(1+P1/H)*FNI(B2,Y,E8)
2880 C2=S(U)*M3/M
2890 PRINT #1,V$
2900 PRINT #1,"            DIRECT COSTS ($million/year) "
2910 PRINT #1, USING U$(13);C2
2920 PRINT #1, USING U$(14);S(U);M3
2930 REM  MAINT
2940 B3=S3(U)*(M3/M)*((H+E7)/(H+E8)) (Y-B2)
2950 F4=F2*B3
2960 V3=V1*B3*P/B1
2970 T4=F4+V3
2980 PRINT #1,V$
2990 PRINT #1, USING U$(15);T4
3000 PRINT #1, USING U$(16);F4
3010 PRINT #1, USING U$(17);V3
3020 REM  SUPPLIES
3030 V4=V5*(A/T)*FNI(B2,Y,E4)
3040 T6=A*H1*M/(B4*2000)
3050 D2=D1*FNI(B2,Y,E1)
3060 T7=T6*P7/H
3070 S8=T7*P6/H
3080 S9=S7*FNI(B2,Y,E1)
```

```
3090 T8=S8*X
3100 C5=C4*FNI(B2,Y,E3)
3110 C6=T8*C5/M
3120 D3=S8*S0*S9/M+T6*A3*D2/(M*H)
3130 F5=O*S5*U*FNI(B2,Y,E4)
3140 V6=V4+C6+D3
3150 S2=F5+V6
3160 PRINT #1,V$
3170 PRINT #1, USING U$(18);S2
3180 PRINT #1, USING U$(16);F5
3190 PRINT #1, USING U$(19);V4
3200 PRINT #1, USING U$(20);C6
3210 PRINT #1, USING U$(21);D3
3220 REM  OFFSITE
3230 S6=S4(U)*M3*1.5/M
3240 PRINT #1,V$
3250 PRINT #1, USING U$(22);S6
3260 REM  ADMINGEN
3270 P4=O*U*H*FNI(B2,Y,E2)
3280 D=C2+T4+S2+S6
3290 A1=10*D/H
3300 A2=P4+A1
3310 REM  ADMINOUT
3320 PRINT #1,V$
3330 PRINT #1,"             INDIRECT COSTS ($million/year)"
3340 PRINT #1, USING U$(23);A2
3350 PRINT #1, USING U$(24);P4
3360 PRINT #1, USING U$(25);Z$;A1
3370 REM  FINAL
3380 T2=C2+F4+F1+A2+F5+S6
3390 T5=V3+V6
3400 T1=T2+T5
3410 F3=T*T2/A
3420 V2=T*T5/A
3430 T3=T*T1/A
3440 PRINT #1,V$
3450 PRINT #1, "             COSTS ($million/year)"
3460 PRINT #1, USING U$(26);T2
3470 PRINT #1, USING U$(27);T5
3480 PRINT #1, USING U$(28);Z$;T1
3490 PRINT #1,V$
3500 PRINT #1,"             UNIT COSTS (mills/kWh)"
3510 PRINT #1, USING U$(29);F3
3520 PRINT #1, USING U$(30);V2
3530 PRINT #1, USING U$(31);Z$;T3
3540 PRINT #1, CHR$(12)
3550 GOTO 3650
3560 REM  REDOESC
3570 I1=2
3580 E8=E0
3590 E7=E0
3600 E4=E0
3610 E1=E0
3620 E2=E0
```

```
3630 E3=E0
3640 RETURN
3650 PRINT
3660 GOTO 1870
3670 CLOSE #1
3680 END
```

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